NOVEMBER, 1924

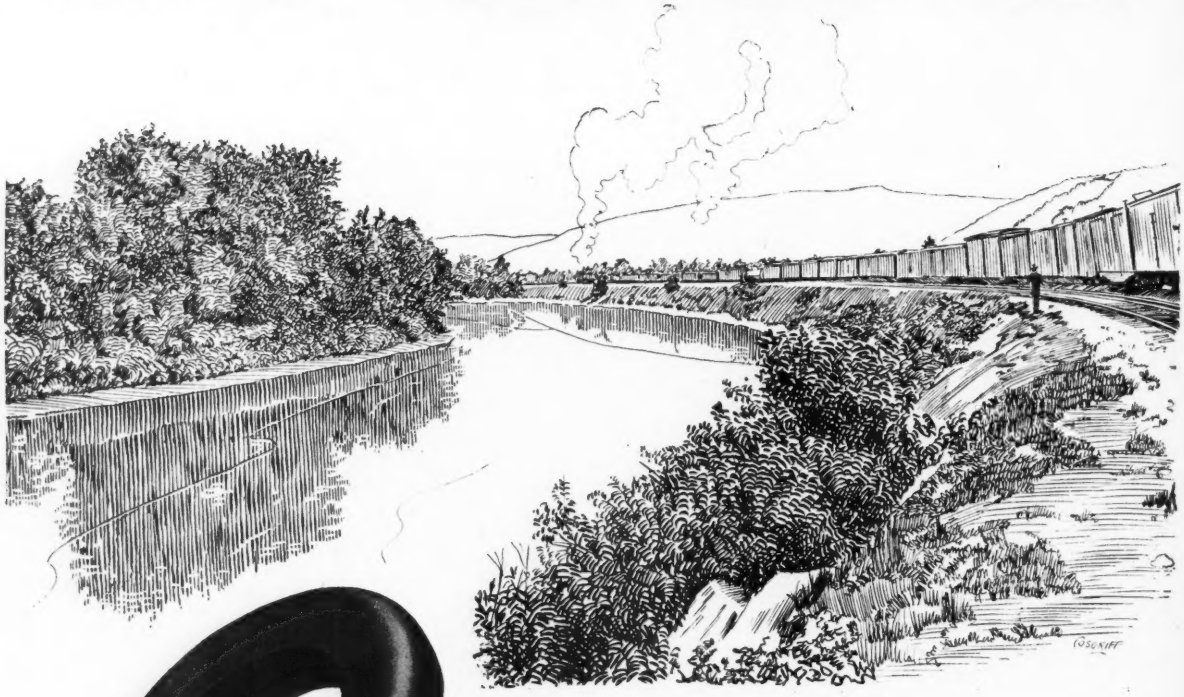
Railway Engineering and Maintenance

Dependable RAIL ANTI-CREEPERS

CHICAGO THE P. & M. CO. NEW YORK

MONTREAL LONDON PARIS CALCUTTA SYDNEY

HY-CROME



HY-CROME saves money two ways—tight nuts, less attention—longer life, fewer nut locks.

THE RELIANCE MANUFACTURING COMPANY
MASSILLON, OHIO

New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco
Engineering Materials, Ltd., McGill Building, Montreal, Quebec, Canada

RAILWAY ENGINEERING AND MAINTENANCE
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Alphabetical Index to Advertisers, Page 42 Classified Index to Advertisers, Pages 40 and 42

You can ride this car all day without fatigue

The Reliable E-6

The "Safety First"

The Mudge "Safety First" on the Imperial Japanese Railways

What Users Say:

A Signal Foreman in the East—

"Have operated a Mudge car for years and always had excellent results. Have operated other cars but like my old Mudge best."

An Inspector in the West—

"Have driven motor cars for past seven years and have used several different kinds, but like my Mudge E-6 better than any car I ever used."

A Signal Lineman—

"I think the Mudge E-6 that I have is a very good car, especially for my territory which has quite a few hills and curves. The hills do not seem so bad since I have had this car."

The permanent choice of inspection officers—*because:*

Of absolute safety;
Smooth riding qualities and stability;
Absence of vibration and sway;
Adequate power;
Can be handled by one man;
Sturdy frame that does not sag;
A transmission designed for the job;
Economy of operation and low maintenance cost.

ONE of the Mudge complete line of inspection and section motor cars; side drive or center load; direct connected or free running; air cooled or water cooled motors

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

Don't confuse the *new* conical-bottom with the *old cone*

The *new* conical-bottom is as different from the old cone bottom as day is from night.

The old cone wasn't practicable because there was no large-diameter mud drum below it to prevent congestion of sludge. As a result sludge accumulated on the bottom and could be removed only with difficulty.

How different in the Horton conical-bottom!

Sludge slides down the ample slope of the conical-bottom—

And falls into a six- or eight-foot hole—

Which is the top of the large riser, or mud drum.

There can be no congestion—as hundreds and hundreds of Horton tanks in actual service have proven.

You will find the conical-bottom unequaled for settling, softening and roadside delivery.

To be sure you receive full satisfaction specify the HORTON conical bottom.

CHICAGO BRIDGE & IRON WORKS
Chicago New York Atlanta Dallas San Francisco
HORTON STEEL WORKS, LIMITED
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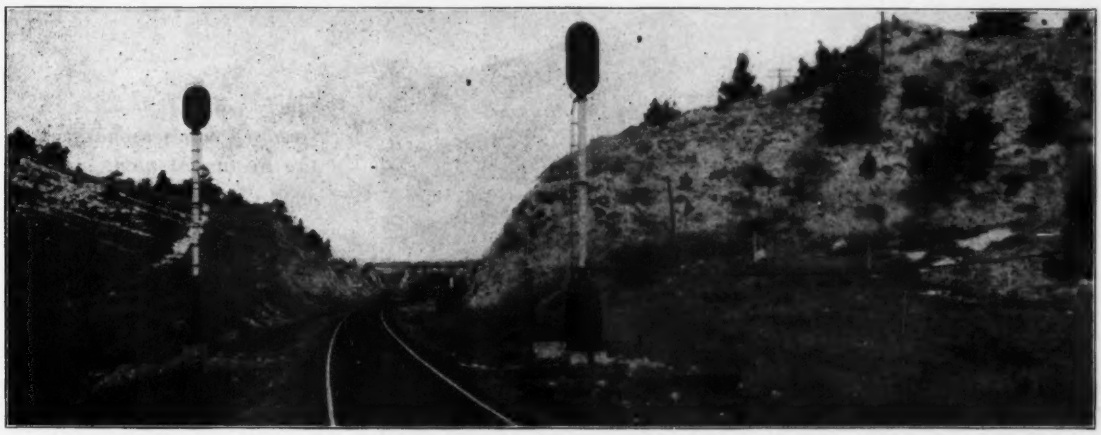
345

HORTON



On the Burlington in Wyoming

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 20 **November, 1924** **Number 11**

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WOULD YOU LIKE TO KNOW?

How to build an effective weed burner?
How ties should be distributed?
How to remove old bridge piers to the best advantage?
What are the relative merits of the different kinds of smoke jacks?
How best to handle the repairs to pumping equipment?

Answers to these and other practical questions will be found elsewhere in this issue.

ELMER T. HOWSON, *Editor*
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Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice.

In sending us change of address please be sure to send us your old address as well as the new one.

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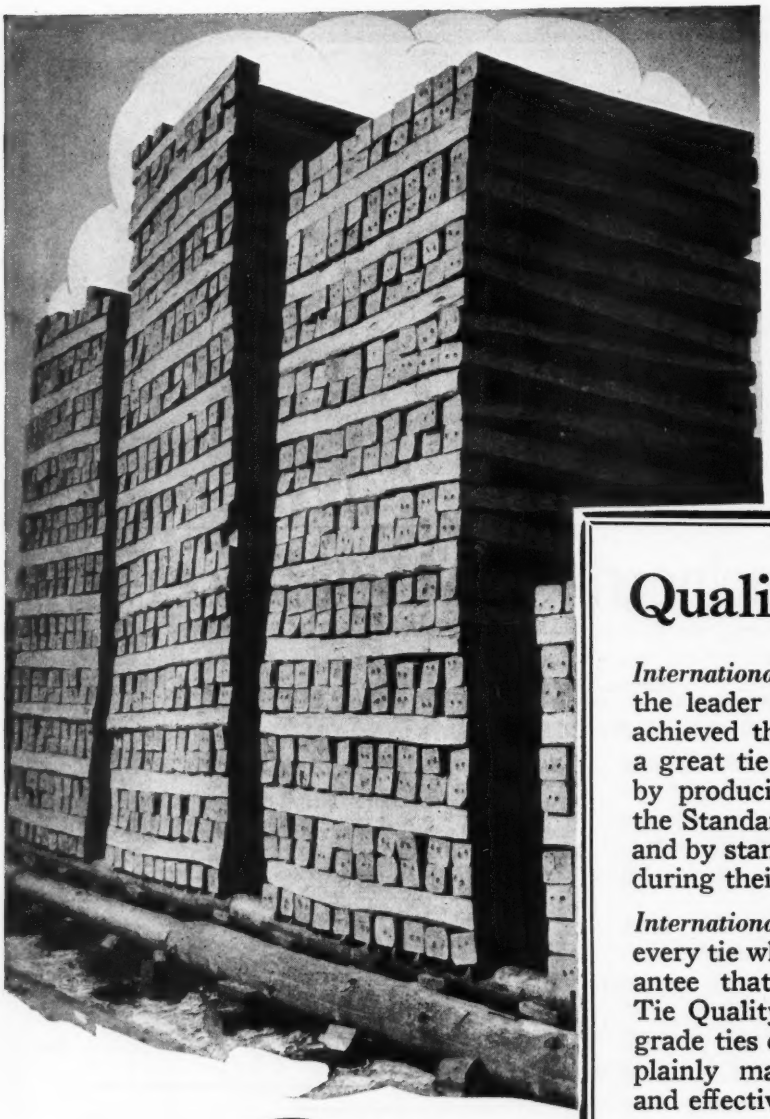


Stacks of Grade 2 and Grade 3 ties seasoning at the Beaumont plant.

Note how carefully the ties are stacked high from the ground on creosoted supports.

This International dating nail is the 18 Karat mark on ties. It's our assurance and your protection.

Quality Leadership

International is proud of its position as the leader in the tie industry. It has achieved this leadership by conducting a great tie business on a quality basis, by producing ties in accordance with the Standard A. R. E. A. Specifications and by standing squarely behind its ties during their entire life.

International inserts its dating nail in every tie which leaves its plants to guarantee that it represents *International* Tie Quality, which means sound, high grade ties of full size, carefully graded, plainly marked, thoroughly seasoned and effectively treated.

To entrust *International* with your tie contract is to guarantee yourself the great value and economy of REAL TIE SERVICE.

International Creosoting & Construction Co.

General Office: Galveston, Texas

Plants: Texarkana, Texas

Beaumont, Texas Galveston, Texas

International

Standard Specification Ties

ARMCO Culverts in Railway Service

No. 12 of a Series

Name of Railway: Southern Public Utilities Co.

Location: Near Greenville, S. C.

Traffic: Municipal Transit and heavy freight.

Installation Data: 48″ ARMCO Culvert, installed 1909 under 5′ fill.

Condition: Excellent. Inspected and photographed Feb. 1923.

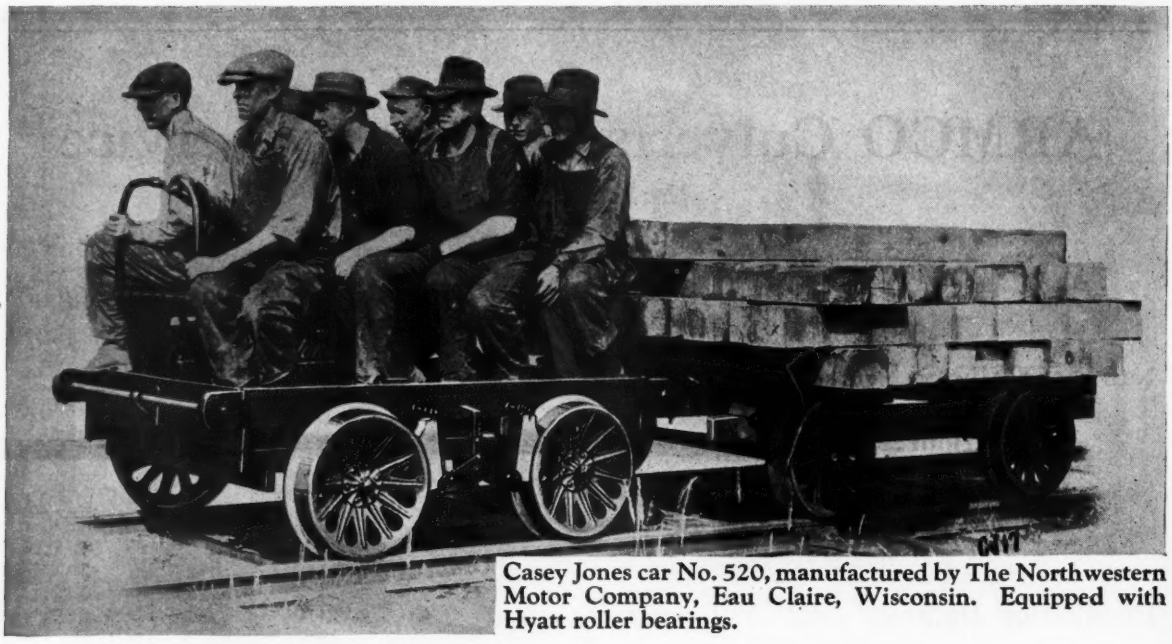
Remarks: Due to changed drainage conditions this culvert was taken up in March, 1923. It was found in such splendid condition that it was reinstalled under the main line of the Piedmont and Northern Railway at Greenville, S. C.

There is a manufacturer in almost every state and in Canada, making Culverts, Flumes, Siphons, Tanks, Roofing, etc., of genuine, rust-resisting Armco Ingot Iron. Write for full information and nearest shipping point on products in which you are interested

ARMCO Ingot Iron

ARMCO CULVERT & FLUME MFRS. ASS'N, 215 North Michigan Avenue, Chicago

ARMCO CULVERTS



Casey Jones car No. 520, manufactured by The Northwestern Motor Company, Eau Claire, Wisconsin. Equipped with Hyatt roller bearings.

Less Friction— Heavier Loads Carried

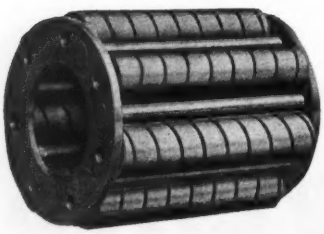
BY replacing the dragging friction of plain bearings with the easily rotating action of steel rollers, Hyatt bearings increase the capacity of maintenance cars.

The Northwestern Motor Company has capitalized this advantage and furnishes its standard Casey Jones cars Hyatt equipped.

Linked with easy running is the rugged strength for which Hyatt bearings are known. These qualities unite with positive oil-conserving lubrication to render reliable and economical car service without bearing repairs or replacements. Oiling every three or four months is the only attention required to keep Hyatt bearing cars in continuous operation.

Replacement boxes containing Hyatt bearings can also be had for converting plain bearing cars.

When buying new cars or overhauling present equipment consider the value of having Hyatt bearings. By specifying "Hyatt equipped" you can insure creditable performance.

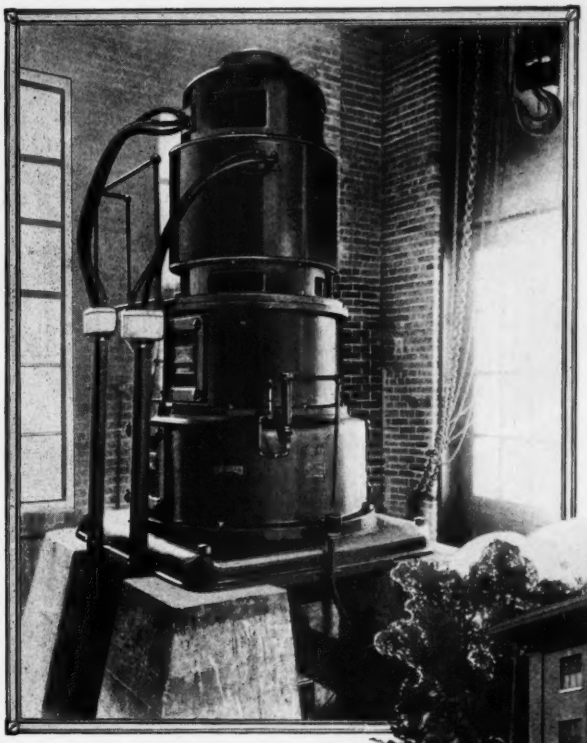


Hyatt bearings can now be had for heavy equipment. *Write for full information.*

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA PITTSBURGH
CLEVELAND MILWAUKEE

HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS

AMERICAN
AURORA, ILL.



Additional Gallonage With "American" Turbines

Pictured is a recent installation of another "American" deep well turbine, furnished with the new totally enclosed head.

This new motor driven head has great rigidity of construction and counteracts any vibration from moving parts in the turbine. It is equipped with water cooled thrust bearing, and the discharge is located below ground, which makes for an unusually compact and neat installation.

The pump is a 17 in. 10-stage "American" turbine designed to have a capacity of 800 GPM against a total head of 480 feet when running at a speed of 1150 RPM. The driving unit is a 175 HP., 3 phase, 60 cycle vertical G. E. motor.

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THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

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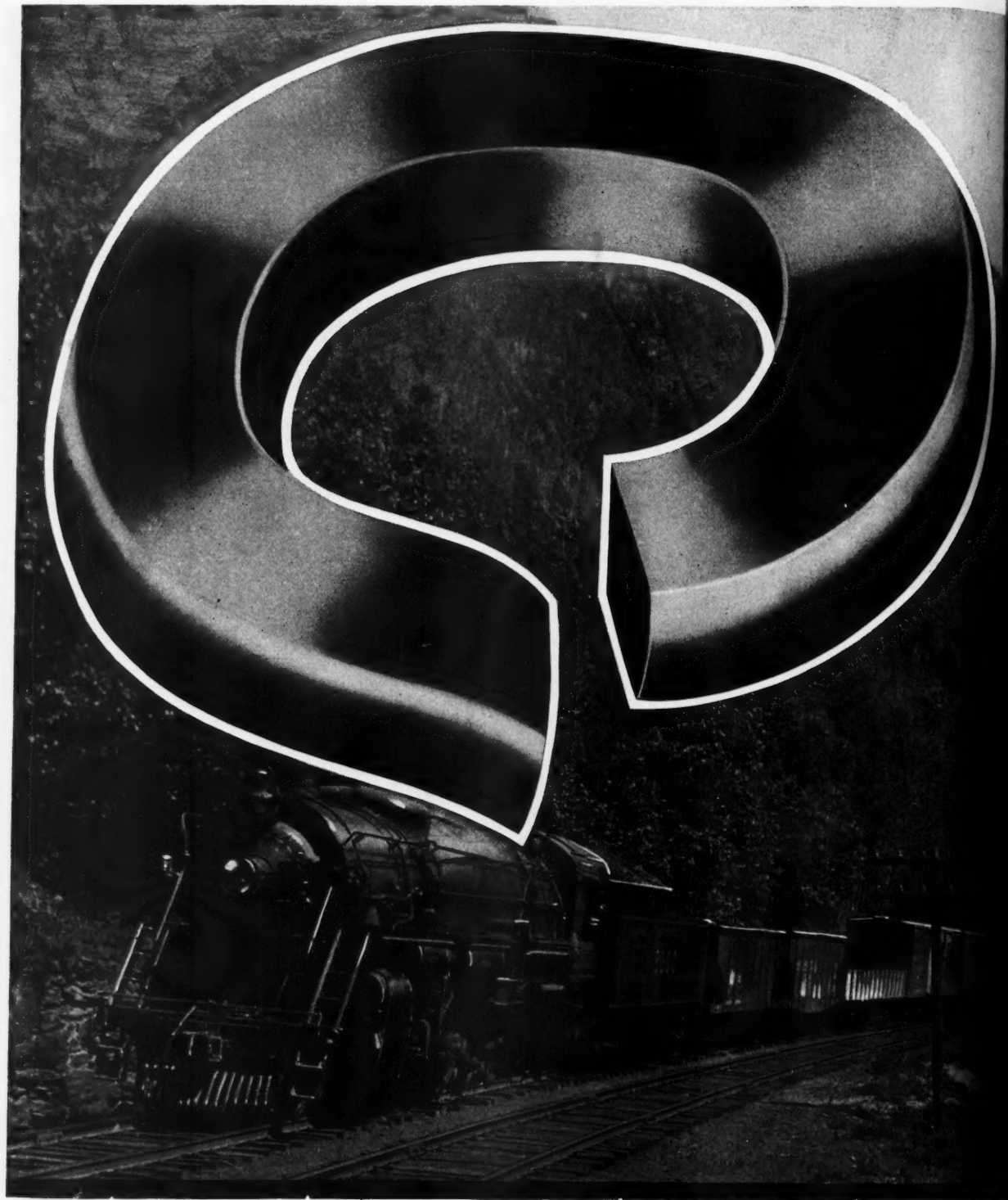
FIRST NATIONAL BANK BLDG



IMPROVED

HIPOWER

Improved HIPOWER is so designed that it permanently and adequately maintains the stress imparted to track bolts by initial wrenching in anticipation of and in preparation for the super stresses induced by heavy rolling loads.

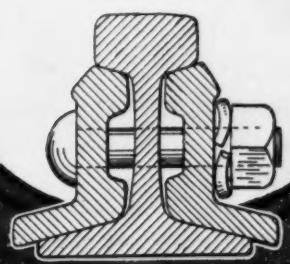
By reason of the enormous reactive pressure *Improved* HIPOWER cannot be compressed completely by ordinary wrenching and therefore becomes *immediately* and *adequately* active to absorb, cushion and distribute the shock of train blows to all bolts and subsequently retards and compensates for any frictional wear of bolted parts.

Improved HIPOWER prevents bolt breakage, eliminates battering of rail ends, reduces breakage of angle bars and minimizes the cost of re-tightening track joints—resulting in the highest standard of track maintenance at minimum cost of labor and materials.

For service rendered *Improved* HIPOWER is the least expensive spring washer on the market. That's why it is universally used.

THE NATIONAL LOCK WASHER CO.

Newark, N. J., U. S. A.



Maintains the Bolted Security of Railway Track Joints

BUDA
ESTABLISHED 1881

Railway Motor Cars

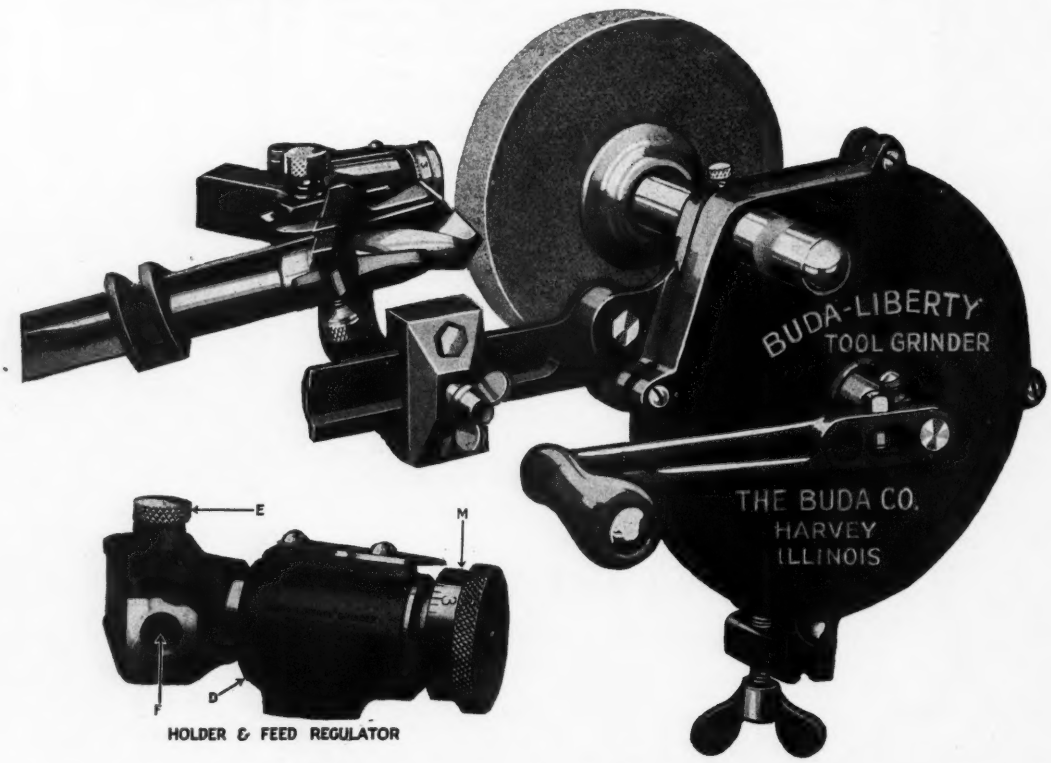
"Liberty"

PORTABLE HAND OPERATED

Tool Grinder

Crossing Gates

REDUCES COST OF TOOL MAINTENANCE TO A MINIMUM



HOLDER & FEED REGULATOR

ACCURATE GRINDING POSITIVELY ASSURED

Easily operated by unskilled labor.
Poor grinding and drawing of temper impossible.
All adjustments by hand—easily and quickly.

THOUSANDS IN SERVICE

Catalog on Request

Track and Bonding Drills

Ratchet Jacks and Cone and Ball Bearing Jacks

THE BUDA COMPANY

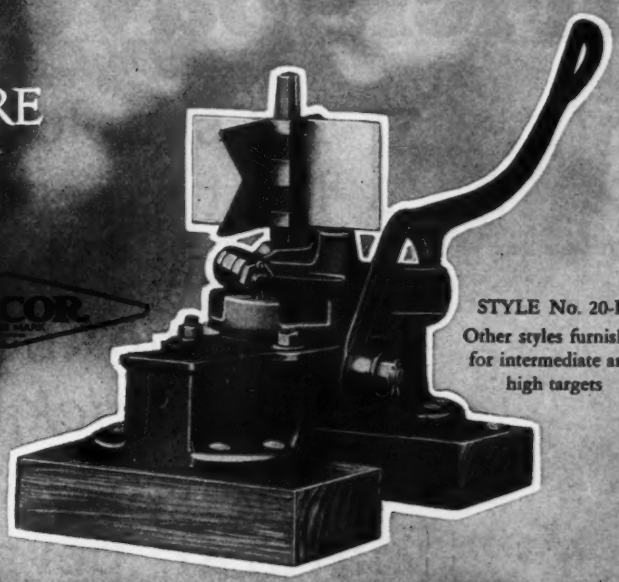
HARVEY [CHICAGO SUBURB] ILLINOIS

30 Church Street NEW YORK
Railway Exchange CHICAGO
Railway Exchange ST. LOUIS
664 Mission St. SAN FRANCISCO
LONDON

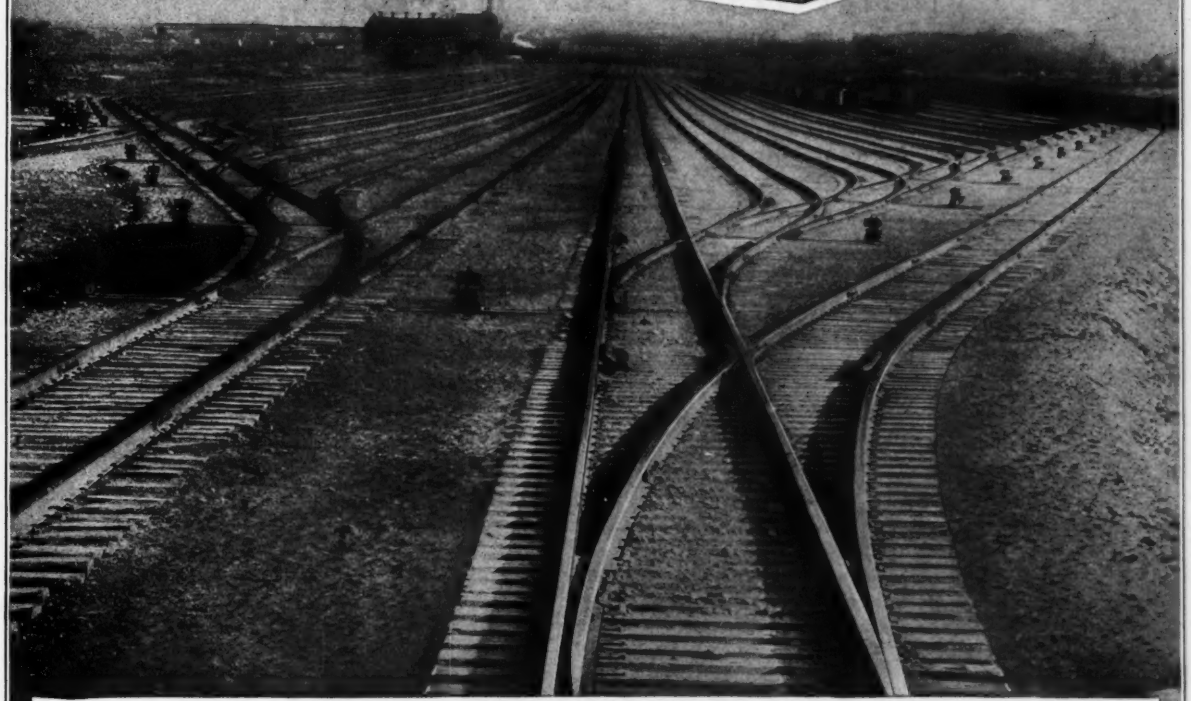
ALL STANDS
IN THIS YARD ARE
RAMAPO SAFETY
SWITCH STANDS

RACOR

Hundreds of other terminals all over the country use Ramapo No. 20-B's exclusively.



STYLE No. 20-B.
Other styles furnished for intermediate and high targets



"SAFETY FIRST"

One of the most dangerous situations in a track is to have the switch points loose with the switch stand target indicating safety. This is often the case when rigid stands are used where there is no electric track circuit protection. The way to overcome this danger is by the use of Ramapo Safety Switch Stands.

Manufactured by

RAMAPO AJAX CORPORATION
HILLBURN, NEW YORK

Works

Hillburn, New York Chicago, Illinois Superior, Wisconsin Niagara Falls, New York

Canadian Ramapo Iron Works, Limited, NIAGARA FALLS, ONTARIO

New York Office, 30 CHURCH STREET - *Chicago Offices,* 2503 BLUE ISLAND AVE. and McCORMICK BLDG.

Also Manufacturers of RACOR Heavy Duty Heat Treated Guard Rail Clamps; Double Shoulder Rolled Switch Plates; Manganese Reinforced Switch Points; Ajax Manganese One-Piece Guard Rails; Switches, Frogs, Crossings and General Railway Track Material

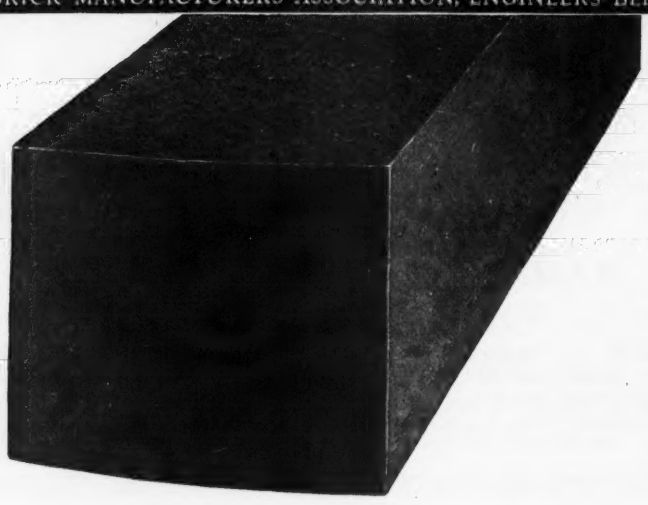
Brick-paved ramps

THE simplest, surest, least expensive way of making ramps safe is to pave them with *vitrified brick*, the paving material with the natural, permanent, skid-proof surface.

VITRIFIED
Brick
PAVEMENTS

OUTLAST THE BONDS

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION, ENGINEERS BLDG., CLEVELAND, OHIO



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Alton, Ill.
Binghamton Brick Company
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Olean, N. Y.
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Thurber Brick Company
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Toronto, Ohio
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Fort Scott, Kans.
Westport Paving Brick Company
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On 17° 20" Curve Under Heavy Coal Traffic

FEW railroads are operating under conditions imposing greater stress on tie plates than 17° 20" curves, or subjecting ties and rails to greater wear than that sustained under the heaviest coal traffic.

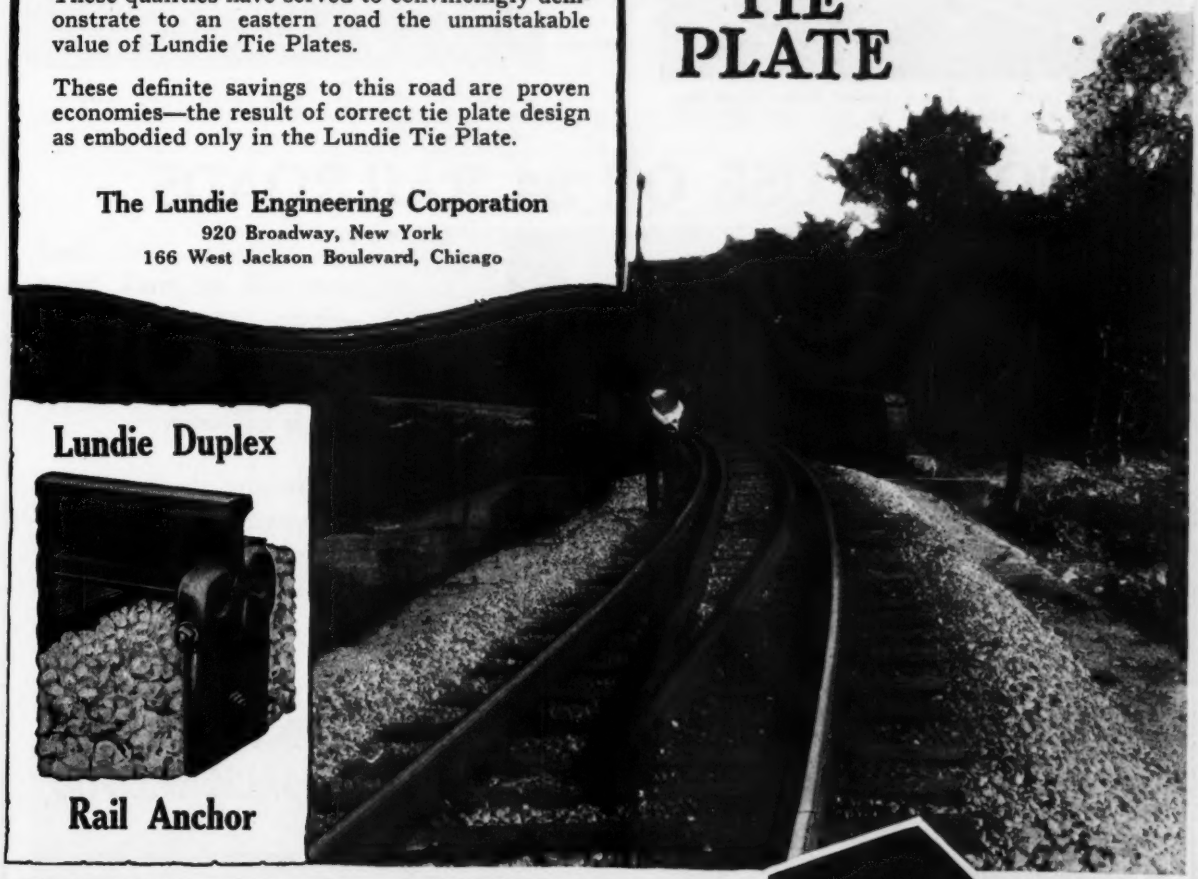
Under such traffic conditions Lundie Tie plates **have held track to rigid gauge—having added 75% to rail life—with practically no mechanical wear on ties after four years of service.**

These qualities have served to convincingly demonstrate to an eastern road the unmistakable value of Lundie Tie Plates.

These definite savings to this road are proven economies—the result of correct tie plate design as embodied only in the Lundie Tie Plate.

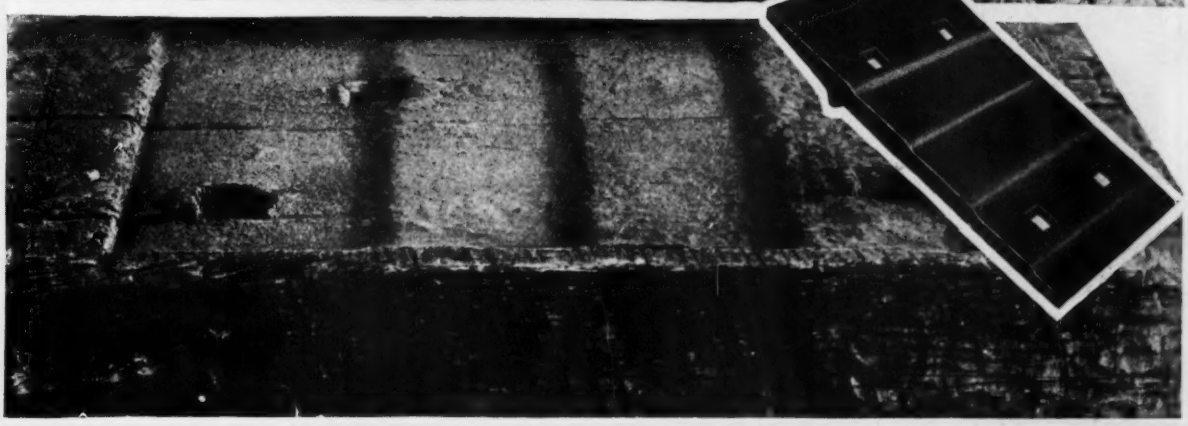
The Lundie Engineering Corporation
920 Broadway, New York
166 West Jackson Boulevard, Chicago

LUNDIE
TIE
PLATE



Lundie Duplex

Rail Anchor



THE IDOL TRACK LINER

GREATEST LABOR SAVING DEVICE FOR LINING TRACK, SPACING TIES AND RAISING LOW JOINTS, AND SURFACING

Three men with Idol Track Liners doing work formerly requiring from seven to nine men with old method.

SAVE 50% LABOR COST

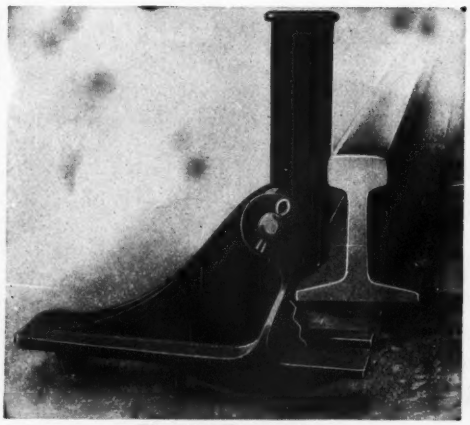
Seven men with Idol Track Liners doing work formerly requiring from fifteen to twenty men with old method.

NOW IN USE ON 84 RAILROADS

You will eventually use the Hackman Idol Track Liner.

WHY NOT NOW!

They will pay for themselves every day by the work you will be able to do with a few men.



The Idol Track Liner

The Hackman Idol Track Lines will line track, frogs, switches, space ties, raise low joints without disturbing the roadbed as no digging is necessary.

By making the proper arrangements we will demonstrate.

We do not fall down.

THE IDOL TRACK JACK AND TIE SPACER WILL DO WHAT ANY TRACK JACK WILL DO

With the Idol Track Jack and Tie Spacer one man can carry his whole outfit on his shoulders, Jack, Wrench, Pick and Shovel and make any ordinary repair along the line without assistants, thereby cutting down track gangs to a minimum.

THE IDOL TRACK LINER CO.

Railway Labor Saving Devices

723 South Wells St., Chicago, Ill.

F. Hackmann, President and Mechanical Engineer **J. J. Franzen, Secretary and Treasurer**

Thos. D. Crowley & Co., General Sales Agents, Track Liner Division, Peoples Gas Building, Chicago

The Baldwin Locomotive Works, Export Representatives

"Mack" "Mack"

Switch Point Protector
Lowers Maintenance Costs

TO KEEP your switches in working order and safe for traffic requires constant switch point repairs and frequent renewals.

The "Mack" switch Point Protector absorbs the shock, diverts by lateral thrust the flange grind that means short life to unprotected switch points.

Records of numerous installations on several different railways have proven that switch points last from five to ten times longer with this protection.

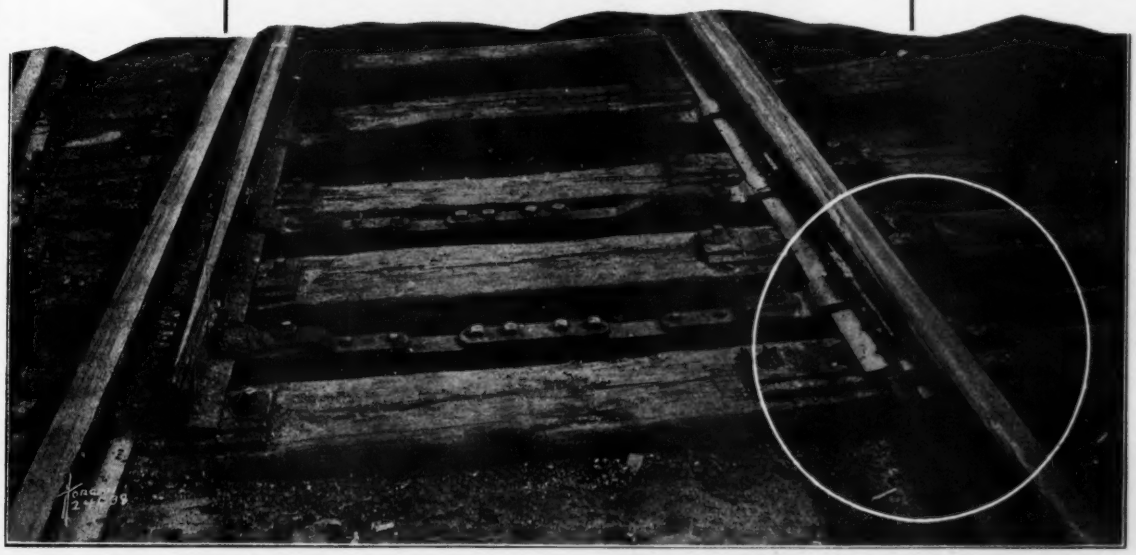
"Mack" Switch Point Protectors are simple, inexpensive and positive in action. They not only prolong the life of the switch point, but also act as a safety device by eliminating the possibilities of derailments. They are easily and quickly installed at small cost. Their replacements can be made by one man in a few minutes.

If you desire a longer service life from your switches, lower maintenance costs and greater safety, it will pay to investigate the "Mack" Switch Point Protector.

Made of Manganese Steel—for any size rail.

Write for complete data

J. R. FLEMING & SONS COMPANY, INC.
Scranton, Pa.



Scene on the Lehigh Valley Railroad near Easton, Pa., showing the 136 lb. rail in service.

"The joint as strong as the Rail."

The success of the 136 lb. section on the Lehigh Valley Railroad is a tribute to modern engineering. Under all conditions this big section of rail is giving gratifying results in carrying the heaviest traffic with minimum maintenance.

To insure the strongest possible bond between this and lighter sections, the Q & C Rolled Steel Step Joint is being used. This joint is made of rolled steel, heat treated and substantially reinforced, making a joint that will outlast the life of the rail.

Send for our latest literature.

The Q & C Company, 90 West, New York

Chicago San Francisco St. Louis

Safe!

THIS new jack can be tripped, or lowered automatically—as desired. No fingering down, therefore absolutely safe.

The automatic lowering feature saves time, affording quick and accurate adjustment to any desired height.

Above all, the new tripping device affords such easy tripping that one man can trip loads formerly requiring two men.

With all its convenience, this jack has only four working parts—all of sturdy, non-breakable design.

Truly a revolutionary new design—tested and approved by prominent railroad men. Ask for further information.

The Duff Manufacturing Company

Pittsburgh · Pennsylvania

Established 1883

Combination Trip and Automatic Lowering Jack No. 110

The Ultimate Track Jack

Ready for Fall Rains

Quick Ditching Neatly Done

A Jordanized Ditch

. . . the fine thing about the Jordan Spreader-Ditcher with attachments is that it's an all-the-year-'round machine. It fights snow, rips out ice, forms ditches, slopes banks, and spreads bulk materials.

We will gladly tell you all about the Jordan. Write for full information.

JORDAN SPREADER
"Does the Work of an Army of Men"
SNOW PLOW * ICE CUTTER
UNIVERSALLY
STANDARD
DITCHER
O. E. JORDAN COMPANY
WALTER J. RILEY, PRESIDENT
EAST CHICAGO, INDIANA

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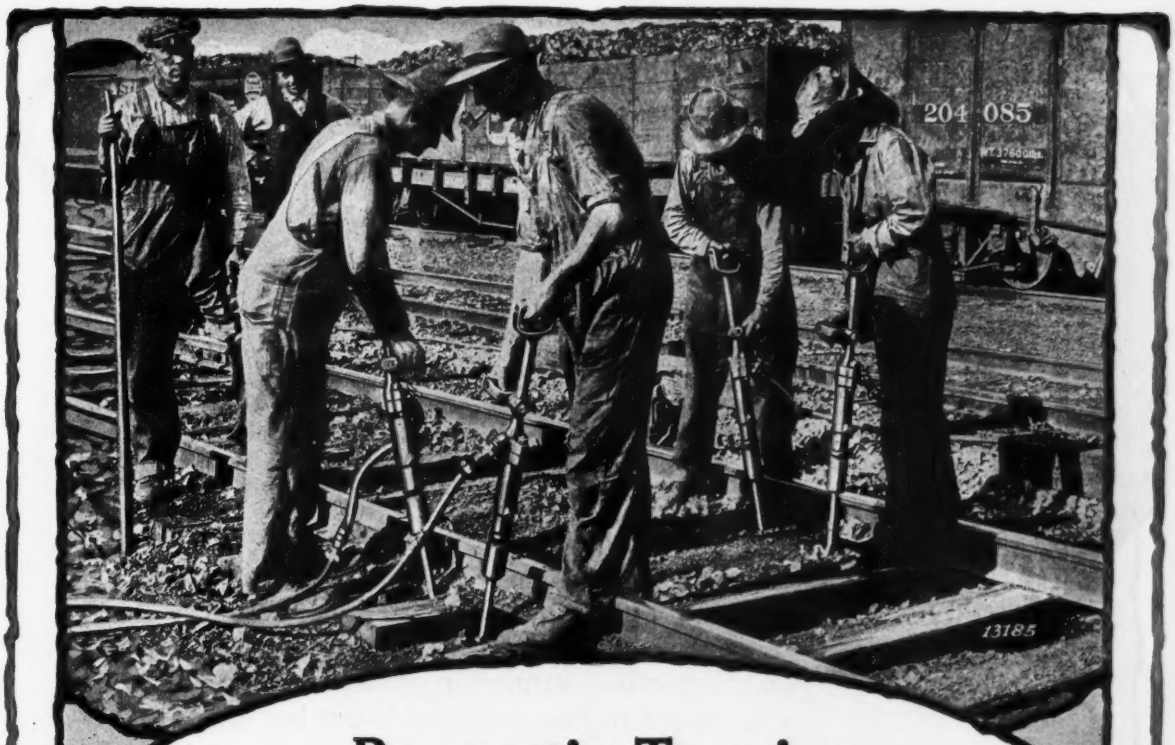

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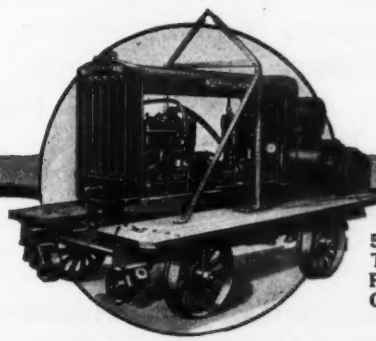

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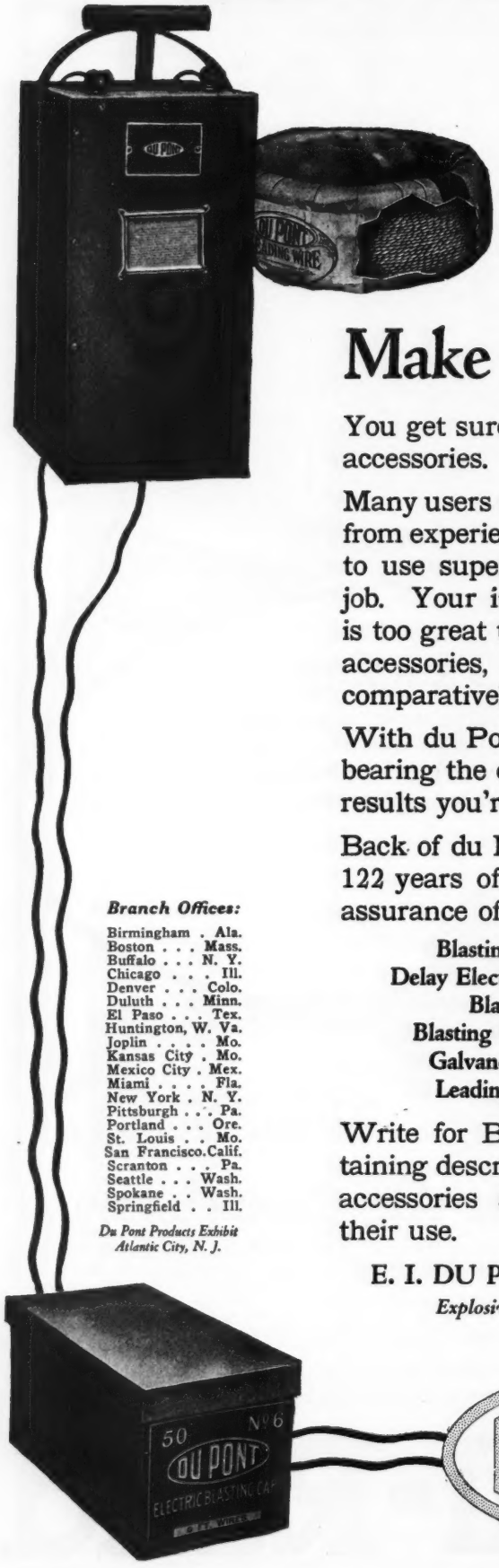

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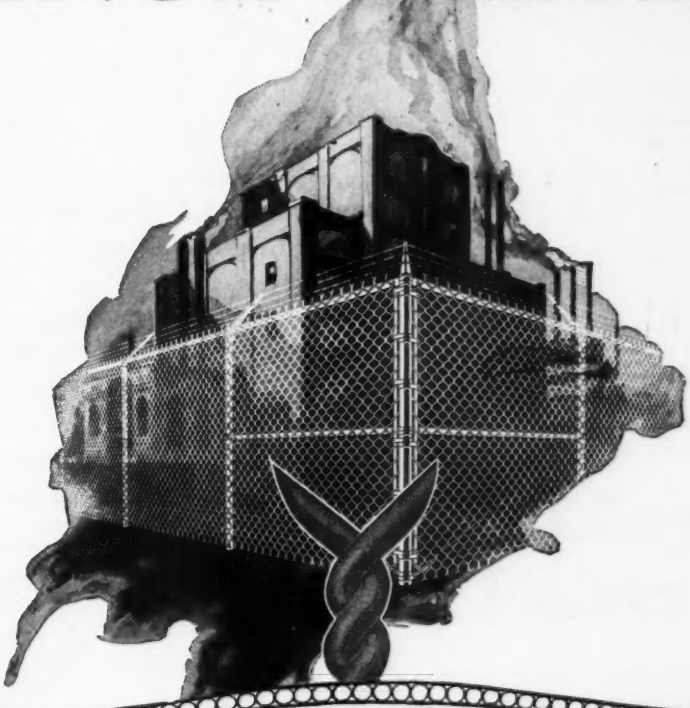

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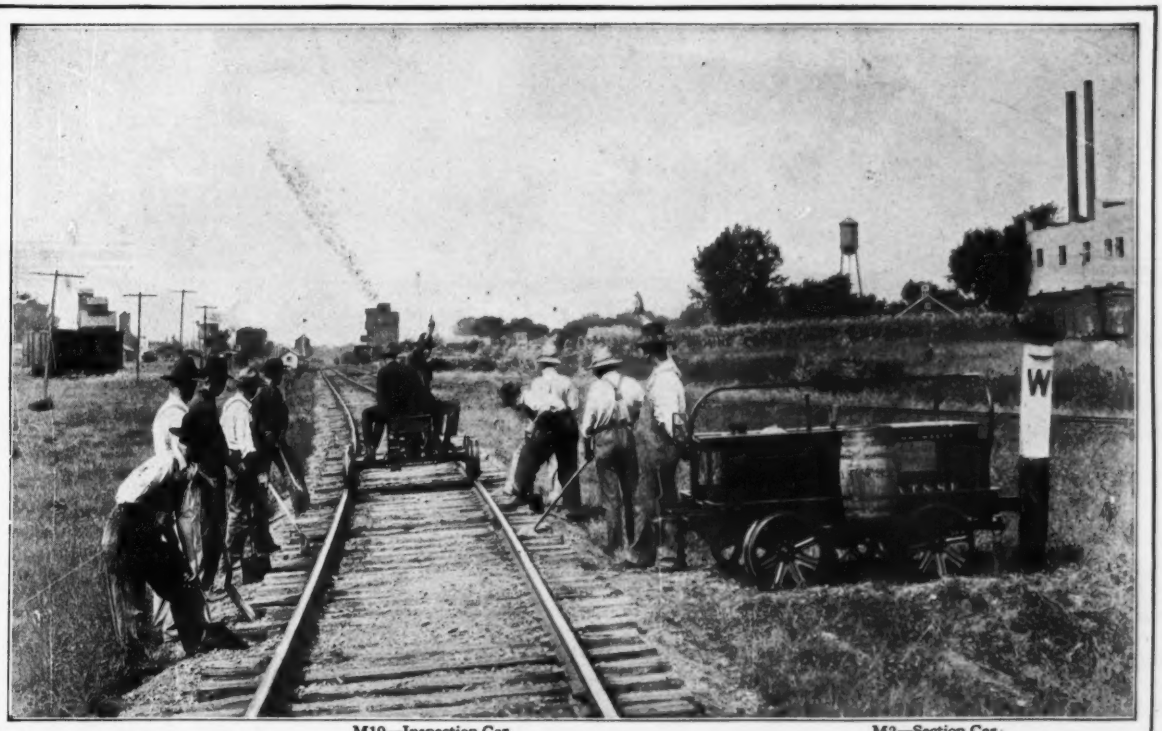

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Performance:- 25 6-horse power Fairmont M2 section cars performed the arduous task of hauling all track materials, push cars and men over heavy grades, making a total mileage of 7000 miles and averaging better than 20 miles to the gallon of gasoline.

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Because they stand the gaff of strictest tests, in action, under all conditions. A consistent delivery of power, quick, dependable and with lowest cost for running and maintenance—whether reckoned in miles or years of service—these are proved by records established on many lines in every state in the union.

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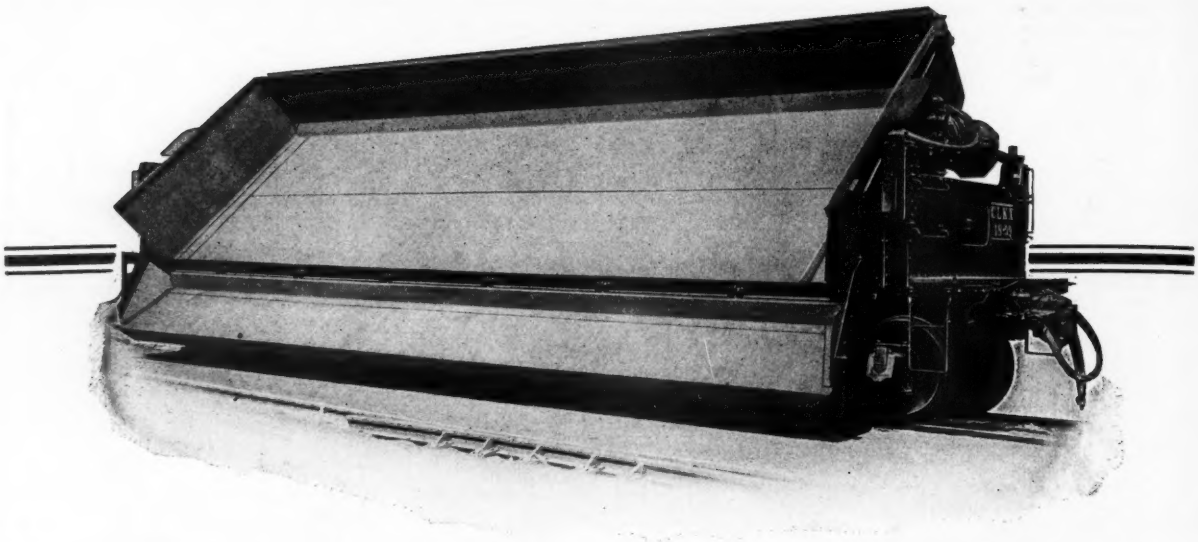

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For these reasons 30-yard Extension Side Dump Cars are a sounder and more profitable investment. They will meet a wide range of requirements more economically than cars of smaller capacity—the cost per cubic yard of car capacity is less, fewer cars are required and the handling and maintenance expense per cubic yard of material moved are less.

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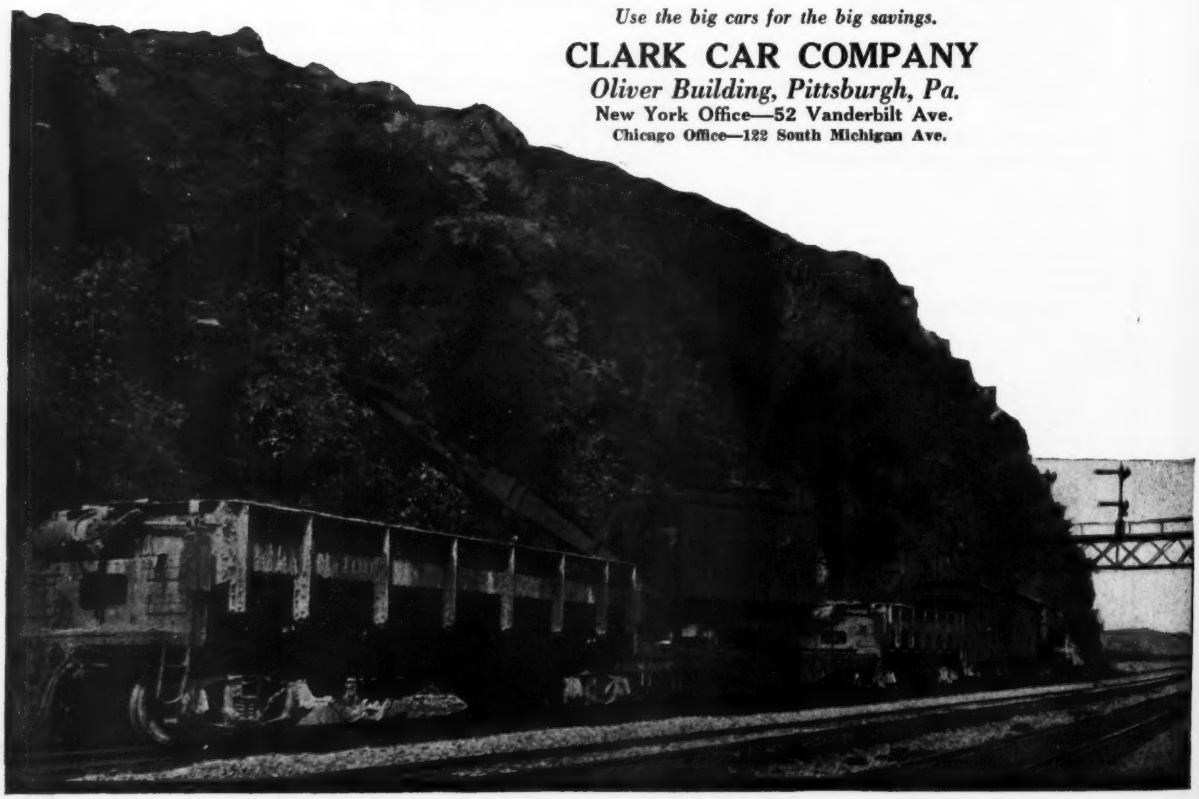


Railway Engineering and Maintenance

Volume 20 November, 1924 Number 11

THE PURPOSE OF ASSOCIATION WORK

THE 1924 conventions of the roadmasters and building associations are now history. The members have gathered to listen to the various papers and reports and have then returned to their homes. It is therefore fair to inquire as to the results of these meetings. They were enjoyable. They were also inspirational. But will they lead to improved maintenance practices on the roads represented at the meeting.

Many men who learn at such meetings of methods which they recognize as superior to those in vogue on their roads, give no evidence of this on their return. Whether through indifference or lack of initiative, they fail to profit from what they have learned and their roads are thus deprived of the benefit which should accrue to them from representation at these conventions.

Organizations such as the Roadmasters and the Bridge and Building associations are justified only by the extent to which they tend to improve methods in their respective branches of maintenance of way work. The function of committee reports and papers is to collect and present information regarding more efficient ways of employing men and materials. The discussion of these reports and papers affords opportunity for the members to add to this information and to pass judgment on the merits of the recommendations. The result of such thorough consideration of a timely topic can not be other than educational.

The work of these associations needs little defense. While it has fallen far short of its objectives and of its possibilities in many instances, it has contributed much to the progress of maintenance of way practices. The great deficiency has been in the application of this information to their daily work by individual members. Every member who believes that a recommendation of a committee is sound and who votes at the convention for its approval owes it to his road to present this recommendation and the reason therefor to his management with the request that he be permitted to put them into effect. It is only as each member brings the developments of these meetings back to his road in this way that the railways can secure the maximum benefit from association work.

THE LANGUAGE OF MAINTENANCE

A LANGUAGE is a living thing which adjusts itself to changing conditions and the passage of time. No better proof of this is to be had than the recent addition of many new words to our speech with the introduction of the radio. Each industry has a terminology all its own and the railroads are no exception.

The words which we use in our specialized work have come into use spontaneously. No one can lay claim to the honor of originating them. They just happened. This explains why the maintenance of way men of two English speaking nations, England and America, speak an entirely different language insofar as their work is concerned. For example, in England a tie is a "sleeper", a track man is a "plate layer", and a foreman is a "ganger." But even in this country, terminology differs in different localities. Terms that are current in one part of the country are not generally used elsewhere. Thus the term "scab" is understood by some bridge men to mean a splice plank, while others do not use this word at all.

In general, such differences in usage are not always of importance, but in some classes of work it is decidedly essential that all concerned have the same understanding as to the meaning of terms. No better illustration of this can be offered than the confusion which exists in reporting rail failures. For example, the terms "split" head" and "piped rail" are often used interchangeably, although each describes an essentially different condition.

Confusion as to terms is not nearly as prevalent today as it was in years gone by, thanks to the periodic meetings of railroad men from all parts of the country through the agency of the various technical associations. It is inconceivable that these men could discuss their work from

THE SPIRIT OF RAILWAY WORK

Forty-seven years ago a bridge foreman in his early twenties was made supervisor of bridges and buildings on an important division of a large western railway, the principal structure on which was a large steel bridge over the Missouri river, a stream noted for its tendency to wander back and forth over a wide flood plain. This supervisor fought the stream continuously for nearly half a century, overcoming an attack in one quarter only to be confronted by a charge from another direction. The struggle was never-ending, always calling for the best in the man.

A few weeks ago this man died. After his death it was found to be his expressed desire that his body be cremated and the ashes scattered over the water from the bridge he had defended so long. His associates who knew of his attachment for the stream saw that his wish was fulfilled, so that in death he still remained with the river which had demanded the best from him during life. This is the spirit of railway service. It calls for true, red blooded men whose work is their life. The day for such men is not passed.

year to year without coming to agreement or understanding as to the meaning of the words they use. Good results have also been obtained by the work of the American Railway Engineering Association, the American Concrete Institute and other organizations in the development of definitions of technical terms and their adoption as standards of practice, but much remains to be done in spite of the fact that certain words have been given preference in the manuals of these associations. Many terms are still used interchangeably. Thus we speak of "rail anchors" and "anti-creepers", we refer to "water columns", "water cranes" and "stand pipes" and to "outside guard rails", "wooden guard rails" and "fender timbers." This condition will of course eventually correct itself. The best word will be sustained in the end and the others will become obsolete, but it is only as railroad men take care in the preparation of reports and papers to insure that they are using the best terms in all cases that we will attain the desired purity and accuracy in the use of our technical English.

BORROWING TROUBLE

IT IS an old saying that a man should never borrow trouble, but the maintenance man who does not anticipate trouble and prepare for it in advance is headed for disaster. Nowhere is this more true than in meeting winter problems. Storms come without warning. When they arrive traffic must be kept moving at all costs. It is then too late to prepare. The man who copes with such situations successfully is the one who anticipates them most completely in advance and who has perfected his organization and assembled his supplies and equipment to meet them most effectively. The man who rises to an emergency is to be commended but the man who avoids emergencies by anticipating and forestalling them is to be commended still more. It is none too early to begin to plan for the storms of the winter and to determine the conditions which may be expected and the manner of meeting them.

CONCRETE WORK IN WINTER

OF ALL of the papers and reports discussed at the convention of the American Railway Bridge and Building Association, which is reported elsewhere in this issue, none presented a more forceful lesson to railway officers who are concerned with bridges and buildings than that on the placing of concrete in winter. It presents an argument for continuing the concrete work through the winter that is not readily refuted, and it would seem that those who oppose this policy are clearly placed on the defensive.

It may be said, perhaps, that the report is lacking in a failure to dwell at greater length on one important factor which has discouraged winter concrete, namely, the long record of defective work and serious failures which must be ascribed definitely to frozen concrete. But the answer to this is that there is now no excuse for allowing concrete to freeze. The technology of winter concrete work has been so thoroughly developed and so completely proven by long experience that the degree of precaution to prevent freezing under any given set of conditions can readily be ascertained and put into effect as the work is carried out. The important question today is not whether there will be danger of freezing but whether the precautions against freezing will cost too much.

From the standpoint of railway construction the second question can be answered favorably in a much greater proportion of the cases than it can for almost any other class of construction. In most cases the problem of protection is not nearly as difficult as for reinforced concrete building construction, which is now being prosecuted every winter, even in sections of the continent where the seasons are severe. Foundations, culverts, bridge piers, abutments and retaining walls usually involve either heavy sections in which a considerable measure of internal heat is developed in the course of the process of curing, or relatively limited elevations above the ground level so that the work may be covered to keep out the cold at relatively limited expense. The same condition holds true in the pre-casting of concrete trestle slabs at the bridge site, and in the building of pre-cast units in permanent plants since this is usually conducted under conditions that are favorable to provision for adequate protection.

In reviewing these considerations there is no thought of discounting the difficulties or expense attending winter work. Rather it is the idea to impress on railway officers the necessity for a careful analysis of the conditions for the purpose of determining just what the difficulties and cost will be, balancing the disadvantages against possible advantages over summer conditions. It is to be expected, of course, that such studies will afford adequate justification for the definite deferment of certain items of the work until more favorable weather. But if the railroads will carry out in the winter time only those parts of the programs for the year's concreting which may be done to advantage in cold weather, definite progress will have been made in the solution of the problem of seasonal unemployment to which serious thought is now being given in this country.

HELPING BUSINESS

IT IS recognized that whatever is good for business is good for the railways for they can prosper only as their patrons do. For this reason every railway man has a direct interest in the constructive work which the United States Department of Commerce is doing for American business. He also has another and even more direct interest, for one of the largest units of American industry is that engaged in the manufacture of railway supplies, and those measures which add to its efficiency or enlarge its activities by opening new markets accrue to the benefit of the railways which are its principal customers.

The Department of Commerce is one of the newest of the major branches of government service and it is only within the last three years that the greatest expansion of its activities has taken place. That phase of its activities which is probably of the most direct interest to railway men is the work of the Division of Simplified Practice which has had for its purpose the elimination of the multiplicity of designs and patterns in industry. It is common knowledge that the wide diversity of designs of rails and track fastenings has little excuse other than the inability of individual engineers in positions of authority to reconcile their views. However, this condition is not peculiar to the railway industry, but is found to an equal or even greater degree elsewhere. Although the work of this division is of relatively recent origin, the Department of Commerce has already been able to effect marked improvements in a number of industries by bringing together the advocates of various designs and aiding them to harmonize their views. Thus, the sizes of paving bricks have been reduced from 66 to 5, rough

faced brick from 39 to 1, common brick from 44 sizes to 1, hollow building tile from 36 to 19, and steel reinforcing bars from 40 to 11, while the number of asphalt grades has been reduced from 88 to 9.

The elimination of waste in industry has been another objective of this department. The conference on unemployment which was called in September, 1921, for the purpose of promoting relief measures to assist the four and one-half million persons then unemployed, devised measures which were instrumental in placing more than one and one-half million persons at work. This was particularly marked in the construction industries owing to a marked increase in the amount of public work undertaken. The problem of seasonal employment, which is particularly acute in the railway industry, has also been studied carefully and it is interesting to note that the Executive committee of the Association of Railway Executives has recently undertaken the study of this subject for the purpose of eliminating seasonal employment among the nearly two million persons in direct railway service and the three million more employed in the production of the materials used by the railways. Marked progress has also been made in stabilizing the coal industry. As a result of the elimination of labor controversies and of car shortage, this industry now faces a long period of continuous operation as a result of which the high cost producer is being eliminated and the industry placed upon a more stable and economical basis.

The Bureau of Standards has inaugurated numerous investigations to promote the improved utilization of raw materials, to cheapen and improve the quality of manufactured articles and to turn to useful purposes the by-products of industrial plants. Among the investigations which it now has under way is a study of gasoline engine performance, particularly as applied to automobiles, with the objective of lowering the gasoline consumption. If this results in only a 10 per cent reduction it will represent a saving of approximately $100,000,000 a year. The bureau is also making investigations of welded rail joints, the fatigue of metal and other technical problems.

In order to promote these measures new departments have been created and others enlarged. Sixteen commodity divisions have been created in the Bureau of Foreign and Domestic Commerce, covering such activities as coal, electrical equipment, etc., each in charge of trained experts drawn from the industry they serve. A Division of Commercial Laws has also been established in the Bureau of Domestic and Foreign Commerce whose function it is to compile and supply information covering legal phases of foreign trade and to assist and give counsel to American firms in the solution of their legal troubles in other countries. The foreign service of the bureau has been greatly expanded, the number of offices having been increased from 22 to 43, while 43 local offices or "service stations" have been opened in various parts of the United States. The commercial inquiries answered by the Bureau of Foreign and Domestic Commerce alone have increased from about 700 per day early in 1921 to more than 6,000 per day at the present time, while the value of these inquiries, as indicated by the replies to some 3,700 individual inquiries from business firms throughout the country, showed an average return of $427 per inquiry or at the rate of more than $529,000,000 for the fiscal year 1923-1924.

While such a record is of the most direct interest to those engaged in the manufacture and sale it is also of interest to railway men.

Letters to the Editor

SECURING BETTER LABOR CONDITIONS

New York City.

To the Editor:

I have read the editorial in the issue of September, 1924, entitled "Camp Cars and Men" with interest. It is especially interesting to note that you stress the failure of the railroad companies to improve the character of the camps in which they house their floating gangs. I am in full accord with the statement that: "As far as the maintenance of way department is concerned there is no greater opportunity for constructive work of this character than the improvement of the facilities in which many employees must live, for which facilities they are dependent on the railway because of the character of their work."

I am inclined, however, to disagree with the statement that "Railway officials are giving much attention to the personnel problem today." It seems to me, from my own personal investigation of this matter, that the average railway officer is uninterested in the personnel problem in-so-far as it pertains to the floating gang. Even the most casual inspection of the average box car camp should be enough to convince the most skeptical that no thought is given to the comfort or cleanliness of the men. The sleeping, cooking and dining cars are often unsanitary to a degree that would not be tolerated in the cheapest "joint" in a city. The men, by reason of their occupation, are compelled to eat and sleep in these unsanitary surroundings, and, to make matters worse, they are served food which is not only poor in quality but insufficient in quantity. As a result of these conditions the average laborer only stays on the job until he has made a small stake and then seeks other employment. This leads to a large labor turnover and tends to decrease the efficiency of the extra or floating gang.

There is, however, a reason for the conditions existing among these floating gangs, or car camps. The railway officers seem to be unaware of the fact that changing conditions have practically eliminated the class of railroad labor which it was possible to secure a few years ago. The time when the padrone could secure and hold as many men as he needed on a job, has gone never to return. The sooner railway officers realize the fact that the class of labor obtainable today expects better living conditions than is found in the average camp the sooner will they be able to build up an efficient personnel among their floating gangs. If the importance of good feeding and good wholesome living conditions for the men in these floating gangs can only be brought home to the railway officers charged with the supervision of this phase of their maintenance of way work a great step will have been taken toward solving this very important labor problem. This may not seem important at the present time when the labor supply is plentiful, but during a labor shortage such as occurred last year, it is of vital importance. The news of how men are fed in various camps soon travels to the labor centers and the company with a reputation for good feeding more easily secures a labor following which fact is of great value during a labor shortage, for men, when they can choose their work, will naturally go to the place where they can get the best food.

Space will permit me to touch only briefly on the financial phase of camp car operations. It appears that

the higher officers of many of the principal railways are either unacquainted with conditions existing among their floating gangs or are blind to the advantages to be gained by improving living conditions. Not only that, but they seem also to be blind to the financial savings to their road which could be brought about by providing proper eating and sleeping quarters, properly managed, for their men. It has been found by investigation that in the majority of cases the maintenance of way camps are still being operated by the padrone system, i. e., by Italian commissary companies and these padrones or commissary operators are given a lot of concessions, such as having their camp help paid by the railroad company, having themselves placed on the pay rolls as labor agents, etc., whereas there are American companies ready and willing to operate on a small margin of profit and without the concessions now granted to the padrone. This will not only save the railroad company many hundreds of dollars per month in actual cash, but will save them many more dollars in reduced labor turnover and an added efficiency among the floating gangs. The fact that some railway officers have stated to the writer that it is not possible for an American company to give the service that is given by the padrone seems ample proof that these men have not kept pace with changing conditions among the laboring classes.

J. U. MEDLEY.

New Books

THE STANDARD SPECIFICATIONS for concrete and reinforced concrete prepared by the Joint Committee created to draft these specifications were submitted to the constituent organizations under date of August 14, 1924, and have now become available in printed form through their publication in the Proceedings of the American Society of Civil Engineers for October, 1924. The Joint Committee was organized in January, 1920, with representation from the American Society of Civil Engineers, the American Society for Testing Materials, the American Railway Engineering Association, the American Concrete Institute and the Portland Cement Association. It is the successor to the Joint Committee on Concrete and Reinforced Concrete organized in June, 1904, which presented its final report on July 1, 1916. The present report supersedes the tentative report of the present committee issued in June, 1921.

While the report as now published does not state specifically that it is the final report of this committee, the presumption is that it is intended as such, subject to modification only as to specific clauses. In addition to the specifications for materials, workmanship and design, covering 51 pages which represent the work of the committee itself, there is appended a series of other specifications for materials, workmanship and tests covering cement, reinforcing bars, standard methods of conducting tests, etc., taken from the standards of the American Society for Testing Materials.

While the specifications for material and workmanship follow the general form of the specifications for concrete and reinforced concrete adopted by the American Railway Engineering Association in 1920, with considerable evidence that the joint committee made extended use of the A. R. E. A. specifications, the new specifications embrace many marked departures from the older one. It is clear that the members of the joint committee were visualizing building construction and the problems encountered therein, in their consideration of the various clauses to the almost entire exclusion of any thought of the special problems encountered in bridge construction. This tendency is even more pronounced in the specifications for design wherein all of the more minute provisions are those relating primarily to conditions encountered in building work.

Recognize Modern Developments

Another characteristic of these new specifications is that they embody a distinct recognition of modern developments in concrete construction practice. The specifications provide for specific application of the slump and colorometric tests, while the clauses covering proportions clearly recognized the necessity for deviations from the arbitrary proportioning of the concrete with normal variations in the aggregates received on the work. However, in introducing these and other innovations, the specifications have been designed in a manner which permits the user a considerable degree of latitude in applying them to the particular job.

Under the general heading of materials, coarse aggregates are specified as consisting of "crushed stone, gravel or other approved inert materials," no specific mention being made of slag. Alternate provisions for reinforcing bars provide for the use of either billet steel bars or rail steel bars, but in a footnote the committee indicates its preference for billet steel.

The clause for machine mixing specifies one minute as the minimum time of mixing and definitely requires that the mixture be equipped with locks on the water measuring device and the discharging lever. The fact that the mixer is now of almost universal application is indicated by the brevity of the paragraph devoted to hand mixing.

The clause covering the minimum temperature (40 deg. F.) of the concrete at time of placing also specifies that it shall not have a temperature in excess of 120 deg. F. The chuting of concrete, which is ignored in the A. R. E. A. specifications, is covered specifically by the Joint Committee but instead of specifying a minimum slope for the chute in the clause devoted to this subject an appended footnote states that 27 deg. is considered the minimum slope permissible. Waterproofing is disposed of by three short paragraphs in which the only specific provision is that "integral compound shall not be used unless specifically authorized by the engineer." Following specifications covering the placing of concrete in sea water a number of short clauses are devoted to concrete in alkali soils or water, a subject which has received little attention in previous specifications.

The section on design specifies unit stresses in terms of percentages of the ultimate compressive strength of the concrete at 28 days, based on tests of 6-in. by 12-in. cylinders or 8-in. by 16-in. cylinders. In general, the percentages given permit higher designing stresses than those which railway engineers have considered conservative practice in the light of normal variations in the quality and strength of concrete made under normal field conditions.

Railway Revenues—Operating revenues of the Class I railroads, representing a total mileage of 236,132 miles, amounted to $508,394,000 in August, the last month of record, according to reports filed with the Bureau of Railway Economics. This was a decrease of $56,134,300, or 9.9 per cent as compared with the same month of last year. Operating expenses decreased 12.6 per cent. The net operating income for the first eight months of the year was at the rate of 4.09 per cent on the property investment, as compared with 4.74 per cent for the same period last year. A total of 13 Class I carriers are shown to have operated at a loss during August.

A typical Stretch of Track After the Weed Burner Passes Over It

Illinois Central Improves Equipment for Burning Weeds With Oil

Economy and Effectiveness of this Process Augmented by Atomizing Oil with Steam

By C. R. Knowles
Superintendent Water Service, Illinois Central

A WEED burner of an unusual type has been operated during the past season on the Yazoo & Mississippi Valley, a part of the Illinois Central System. This burner is an outgrowth of the experience of this road in burning weeds between Memphis, Tenn., and New Orleans, La., during the last 10 years. While the machines which had been used (described in the *Railway Maintenance Engineer* for September, 1917) proved to be efficient labor saving devices in their original form, the recent improvements have resulted in still greater efficiency of operation.

The greater part of the Yazoo & Mississippi Valley is located in a semi-tropical climate and the track is subject to dense vegetation of a very rapid growth. While ordinarily it is considered sufficient to mow the right of way and "grass" the track once each year, it is necessary to perform this work twice a year on the Yazoo & Mississippi Valley, the first cutting being done late in the spring and the second in the early fall. In addition to heavy vegetation such as Johnson grass, crab grass, horse tail and sweet clover, a heavy growth of Bermuda grass is usually present, which has to be pulled by hand, bringing the expense per mile of track for weeding up to $75 to $100.

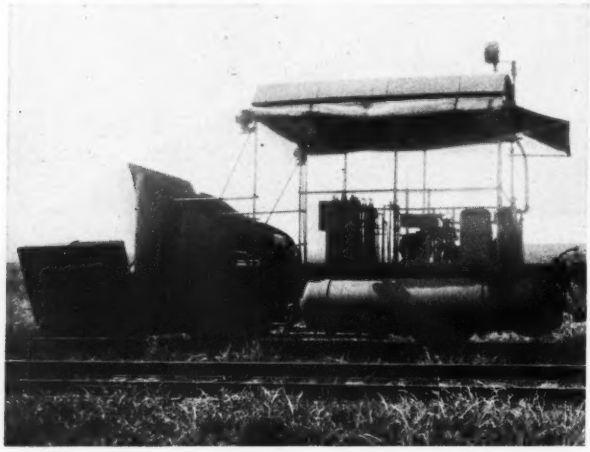
The burners originally purchased were what were known as Commonwealth weed burners, the entire machine being self-contained, operating on its own wheels and under its own power. The main frame of the burner was a steel casting, the center, side and end sills, transoms, engine foundation and floor all being in one piece upon which the engine, burners, etc., were mounted. This machine was equipped with a 60 h. p. three-cylinder reversible air starting engine, together with an air pump which was driven from the main shaft of the engine for operating the air brakes, forcing the oil from the tanks to the burner and for raising and lowering the wing burners. Both engine and burners were originally designed to burn gasoline. However, after the machines were received certain changes were made. These included a complete new system of heating coils of a different design from those originally furnished, and changes in the burner tips and shrouds which permitted the use of a low grade distillate or gas oil which was much cheaper and at the same time safer than gasoline. These machines were operated on the Vicksburg and New Orleans divisions up to 1923 when it was necessary practically to rebuild them with the exception of the trucks and frame.

Oil Atomized by Steam

The maintenance of way department for some time had been considering the advisability of providing

A View of the Weed Burner in Operation.

some means of atomizing the oil used in burning with a view of improving the efficiency of the machine through increased mileage and better economy in the consumption of oil. The gasoline engine, being one of the earlier types of engines, gave more or less trouble, resulting in delays and frequent repairs, and it was thought that the increased cost of operating the machine with a locomotive would be more than offset by more continuous operation. The removal of the engine from the burner also made room for two steam-



A Side View of the Burner Showing the Underside of One of the Wings.

driven oil pumps, controlling valves, etc. Two locomotive air pumps were placed on a flat car and the air necessary for the operation of the burner and atomizing the oil was generated in this manner with steam from the locomotive.

The operation of the burners throughout 1923 was improved materially through the atomization of the oil by air and as the arrangement of air pumps on the flat car was a temporary arrangement it was decided to make the atomizing equipment permanent and locate it on the burner with the remainder of the equipment. Difficulties were encountered, however, on account of the fact that there was not sufficient room on the burners to install an air compressor of the desired size. Experiments were then conducted with a view to using steam instead of air for atomization. This proved entirely successful and as steam could be secured from the locomotive the remodeling of the machines was considerably simplified.

The burner tubes used in atomizing the oil are largely responsible for the success of the improvement. These burner tubes, which are patented, consist essentially of a cylindrical casing within which is a central bore closed at the outer end and provided with slots parallel to the axis of the bore on the periphery. These slots, with the inner wall of the casing, form longitudinal ports through which the oil is blown. Each port forms a small tube constricted at the center and flared at each end. The throats or constricted parts are connected with the interior bore of the burner tube by means of radial openings. The oil is delivered by the oil pumps at a pressure of 70 to 80 lbs. per sq. in. to the central openings and forced through the radial openings to the ports where it comes in contact with the steam and is blown from the burner in the form of a fog or vapor which is readily ignited. The steam is delivered to the burners or jets at locomotive boiler pressure, the moisture being taken from the steam by means of a trap, and the steam being superheated to a certain extent in passing through the steam lines, which are placed immediately over the burners.

Each burner requires 17 of these tubes, 7 tubes being placed on each of the movable wing burner plates and 3 on the fixed center plate, the iron shrouds extending about 8 in. below the plate to bring the flames close to the ground. Flexible joints are used in making steam and oil pipe connections from the center burner plate to the wing plates.

The delivery of the oil and steam to the burners is controlled by batteries of valves located on the deck of the burner as shown in the illustration. The oil reaches the burner from tank cars by means of flexible hose through which it is forced by the oil pumps. The steam required for the atomization of the oil is discharged from the locomotive through the regular train lines. Two duplex oil pumps are provided, one of the pumps being held in reserve. The pumps are controlled by pressure governors, thereby maintaining a uniform oil pressure on the burners at all times. The steam pressure is also maintained uniform by means of reducing valves.

Advantages of New Burner

In addition to the greater economy in the use of oil and the increased mileage, there are other advantages over the old method of operation as follows:

1. The burners can be ignited or extinguished instantaneously as compared with a delay of 3 to 4 min. in extinguishing the burner and from 20 to 30 min. in lighting the burner on the old machine.
2. The flame on the new burner can be controlled at the will of the operator, which was not possible with the old machine. For example, in light vegetation the intensity of the flame can be reduced or it can be increased when heavy vegetation is encountered.
3. Operating the machine with a locomotive has

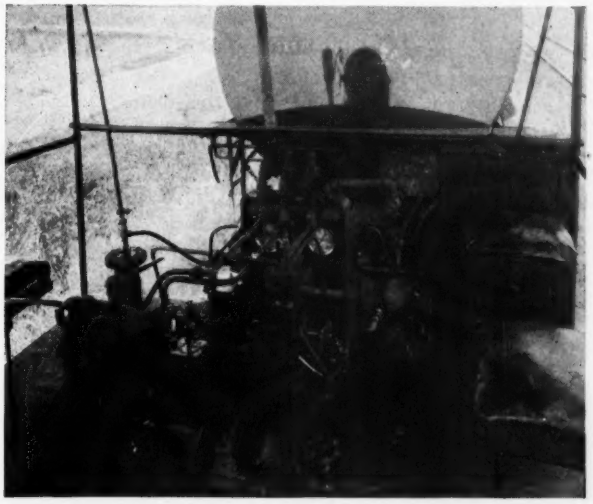
A Front View of the Burner Showing the Type of Construction and Method of Operation.

provided a more satisfactory means of propelling it and has eliminated a great deal of the delay which formerly occurred due to the necessity for making frequent repairs to the old gasoline engine. On account of the more intense flame obtained by steam atomization it is now possible to operate the burner during showers or light rains, which was not possible with the old burner. Apparently there is little difference in the effect of the burner on the vegetation during light

rains as compared to burning during the dry weather.

The new machine also thoroughly burns all side tracks, passing tracks and spurs, which was not possible in all cases with the old machine on account of the difficulty and delay in igniting the burner especially for short spurs.

The burning of weeds has been speeded up to such



The Forward End of the Operator's Stand Showing the Oil Pumps.

an extent that the two burners as now equipped can do the work of at least three burners of the old type. It is expected that the two burners will now be able to cover the entire Yazoo & Mississippi Valley instead of only two divisions as before.

Weeding Costs Cut

During the month of July, 1924, the two machines burned 1286 miles of track at an average cost of $6.20 per mile as compared with an average cost of $9.17 for 1922 and 1923 with the old burners. A detailed statement showing the cost of operating both burners during the month of July follows:

Fuel oil	$2,291.50
Supplies	21.72
Work train	3,559.00
Burner crew	934.31
Section foremen	282.39
Section laborers	889.57
Total	$7,978.49
Miles burned	1,286
Cost per mile	$6.20

The cost of weeding track by hand in the territory served by these burners is from $75 to $100 per mile and as the same result can be accomplished with from two to three burnings per year at a cost of less than $20 per mile, it is apparent that the burners are accomplishing decided economies in track maintenance.

Method of Operating

Each weed burning outfit is provided with cars for the burner crew, train crew, supplies, etc. This outfit consists of one combination kitchen and dining car, one sleeping car with accommodations for six men, one tool and supply car and one tank car for oil. The machine requires a crew of two men for its operation in addition to the train crew. A section foreman, using a motor car, follows the burner over each section with a sufficient number of section men to extinguish small fires which may occur in ties, etc. This fire-extinguishing crew is provided with water buckets and a barrel of water which is carried on the car. A swab is used for extinguishing fires in ties as it is more effective than dashing water on them and requires much less water. This crew follows immediately behind the burner, extinguishing all fires that are visible. It is also customary to have a man pass along the track about an hour after the burning to extinguish any fire that might have been overlooked, particularly in connection with bridges, culverts, etc. The old oil tanks on the burners are utilized for water storage and are connected with air pressure from the locomotive which furnishes a pressure system for fire protection in the event that it may be required.

No serious fires have occurred through the operation of these burners. Tie fires are confined exclusively to decayed or shattered ties, there being little if any likelihood of fire occurring in good ties.

The operation of these burners has been so successful that a third burner will be built and placed in service on the Illinois Central next season.

Increased Use Made of Treated Timber in 1923

THE amount of timber treated during 1923 was larger than in any previous year in the history of the wood preservation industry. This and other pertinent facts concerning the treatment of ties and timber in the United States have been made available in a report recently issued by the Forest Service of the United States Department of Agriculture in co-operation with the American Wood Preservers' Association. A total of 53,610,175 crossties were treated last year, or 12,293,701 more than in 1922. The total for 1923, however, is 1,773,340 less than for 1921, which was the record output of treated ties, but the total quantity of timbers of all kinds subjected to treatment during the past year was 224,375,468 cu. ft., as compared with 166,620,347 for 1922, and 201,643,228 for 1921, which was the largest previous maximum. The increase in the total for all classes of timbers in spite of the fact that the number of ties treated was not as large as in 1921, is accounted for by a marked increase in the treatment of piles, poles, crossarms and construction timbers, since in all of these classes the quantity treated in 1923 exceeded all previous records. While the amount of wood blocks and miscellaneous materials treated was larger than in 1922, the record for 1923 had been exceeded previously.

To treat a record volume of timber required the consumption of the maximum amount of treating materials used in the industry in any year. The preservatives used during the year were as follows: 127,417,305 gal. of creosote, 1,507,932 gal. of paving oil, 28,830,817 lb. of dry zinc chloride and 4,706,968 gal. of miscellaneous preservatives. Of particular interest in this connection is the marked increase in the use of creosote, which exceeded the consumption for 1922 by 41,095,916 gal., or 48 per cent. The statistics show an increase in the use of all preservatives except zinc chloride, of which the volume used was 1,037,822 lb. less than in 1922, and but little more than half of the quantity used in 1921.

Statistics dealing specifically with crossties show that 34,722,570 were impregnated with creosote, 15,379,335 with zinc chloride, 3,502,391 with a zinc-creosote emulsion and only 5,879 with any other preservative. The creosote treatment ranged from 3.67 to 12 lb. of oil per cu. ft.; that with zinc chloride ranged

from 0.4 to 0.515 lb. per cu. ft., while that with the zinc creosote emulsion required the use of 0.457 to 0.51 lb. of salt and from 1 to 2.04 lb. of creosote. Of the ties treated in 1923 the largest quantity comprised oak ties, of which 16,899,670 were treated. The quantity of yellow pine almost equalled this, with a total of 16,842,251. Douglas fir was third with a total of 5,953,143.

Cubic Feet of Timber of Various Classes Treated in 1922-1923.

Classes	1922	1923
Crossties	123,949,422	160,830,525
Piles	7,496,789	9,569,443
Poles	17,008,640	26,886,904
Wood blocks	3,947,551	4,932,307
Cross arms	374,829	420,206
Construction timber	12,713,080	18,837,795
Miscellaneous lumber	1,130,036	2,898,288
Total material treated	166,620,347	224,375,468

Wood Preservation, 1909-1923, Together With Consumption of Creosote and Zinc Chloride

Year	Total Material Treated Cu. Ft.	Number of Cross Ties Treated	Creosote Used, Gal.	Zinc Chloride Used, Lbs.
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,888	40,260,416	108,378,359	26,466,803
1914	159,582,639	43,846,987	79,334,606	27,212,259
1915	140,858,963	37,085,585	80,859,442	33,269,604
1916	150,522,982	37,469,368	90,404,749	26,746,577
1917	137,338,586	33,459,470	75,541,737	26,444,689
1918	122,612,890	30,609,209	52,776,386	31,101,111
1919	146,060,994	37,567,927	65,556,247	43,483,134
1920	173,309,505	44,987,532	68,757,508	49,717,929
1921	201,643,228	55,383,515	76,513,279	51,375,360
1922	166,620,347	41,316,474	86,321,389	29,868,639
1923	224,375,468	53,610,175	127,417,305	28,830,817

How Rail Allotments Are Made

As a Superintendent Sees It—

If you think it's rail you need
On which to run the cars,
Just ask the track inspector,
He will furnish angle-bars.

And when the joints are battered,
And joint ties out of place,
If you ask the track inspector
You will surface out-of-face.

And if your traffic's heavy,
For rail that is too light,
Just ask the track inspector
And you'll find that it's just right.

And if the bolts don't fit the holes
And the bars are badly bent,
Don't ask the track inspector
Or you'll wish you hadn't went.

As a Track Inspector Sees It—

Now listen my children and you shall hear
How budgets and programs are made so queer,
You'll hear how a roadmaster perpetrates crime;
Condemning good rail that is yet in its prime.

Twas a call from the superintendent,
The roadmaster knew what it meant.
So he took off his hat and brushed back his hair
And picked up his note-book and went.

He opened the door of the sanctum
And slowly walked up to the throne.
"Take a seat, Mr. Walsh," said his highness,
"I wanted to see you alone.

"For we're come again to the season
When budgets and programs are due;
And for needs of the track and the roadway,
I shall have to depend upon you.

"So smoke this White Owl while you tell me
(And please don't hold anything back)
Just what you require and what you desire
To patch up your broken-down track."

John Walsh took his notes from his pocket,
In his mind hope and memory did blend;
Then he picked up the Owl from the table,
And fiercely bit off the wrong end.

"Mr. Sweeney, I'm footsore and weary,
I've walked and I've motored by track,
I've looked at it going southward,
And I've looked at it coming back.

"I've discovered that most of our trouble—
(And I proved it at hundreds of points)
Lies not in the spikes or the tie-plates,
But is due to misfit at the joints.

"But why this misfit, you will ask me;
Oh! Why should our joints thusly fail?
And I tell you the truth, Mr. Sweeney,
When I say 'Tis the Rail! 'Tis the Rail

"You see the rail's old and it's rusty,
(And it's very much worn in the fish),
But replace it with new and like magic,
That track will be smooth as you wish.

"You've mentioned loose bolts to me often,
And I know that's the cause of some jolts;
New rail with new holes is the cure—
And Holes are much cheaper than Bolts.

"There are thousands of spikes with their throat cut,
And of brine-eaten plates there's no end—
With new rail we replace all these fittings,,
So I ask: What's the answer, my friend?

"There's a great many miles out of surface,
New ballast great cost would entail;
So we'll span all the sags and the low spots
With some new and much heavier rail.

"And last but not least, I'd remind you,
Our force has been kept down so low
That many odd jobs are neglected
While our officers think we are slow.

"But give me the rail that I'm asking,
Then when extra gangs come to relay,
We will do these odd jobs in a hurry
And make some A. F. E. pay.

"So the answer, you see, is quite simple,
And I hope I have made it quite clear,
That new rail for just half of my main track
Should be furnished for relay next year."

I think you now see, my dear children,
(And I hope it don't make you too sad)
Why programs sometimes must be censored,
And why track inspectors go mad.

Effecting Economies in Distributing Cross Ties and Lumber*

Studies Show Orderly Movement Vital to Railways in Cutting Costs of Forest Products

By H. R. Condon
Assistant Forester, Pennsylvania System, Philadelphia, Pa.

FOREST products, for which railroads expend more of their revenue than for any kind of material except fuel, are, with few and relatively unimportant exceptions, bulky and expensive to transport and handle. Consequently any economies that may be effected in receiving and distributing a railroad's requirements of wood should have the earnest consideration of all who may aid in laying down material where it is to be used with the least practicable expenditure of time and effort. To purchase the material called for by a requisition at the least initial expense is not always economy; the cost in place is an important factor in determining value.

Any worthwhile scheme of distribution must be based on an orderly and economical movement of material from producer to user, and while it is recognized that emergency requisitions will be made as long as railroads operate, such demands should be held to an absolute minimum. That desired result cannot be obtained until all users of material are educated to an appreciation of the losses caused by failure to anticipate requirements sufficiently in advance of need to permit of economical purchase and distribution. It is essential, therefore, that material users co-operate in a distribution plan to the extent of forecasting and requisitioning material far enough in advance of need, whenever possible, to permit supply organizations to provide the forest products desired.

Unsuitable and costly substitutions are too often used necessarily to fill requisitions for delivery "at once." That is particularly true of requirements for preserved wood, which preferably should be purchased and stored for a considerable time before treatment. Hardwoods must be air-seasoned from 6 to 18 months preliminary to adequate preservation, consequently the originator of a requisition for treated hardwoods to be supplied within 30, 60, or 90 days, cannot be supplied with them unless his needs have been anticipated for procurement of the wood well in advance of the request for it, as it is seldom that the required stock is available for purchase in a thoroughly-seasoned condition, and treated material of the various grades and dimensions needed is rarely stocked for sale by commercial organizations.

Losses Through Lack of Anticipation of Demand

It is unfortunate that there exists in some quarters an apparent lack of appreciation of the extent of losses due to failure to anticipate demands which can be forecasted, even where the extensive use of preserved wood is recognized as profitable practice. Consequently there are used annually very considerable quantities of untreated wood where decay is known to be the primary cause of failure in service, and for which treated wood is desired but unobtainable.

While the failure of consumers to make known appraisable future requirements is directly the responsibility of the consumer, purchase and stores organizations do not function properly unless they exhaust every means to have such requirements anticipated and provided for. There are many items of forest products for which the yearly demand is fairly constant, and which on some roads are used only after treatment whenever so obtainable. For such materials storekeepers can and should obtain requisitions for stock account, and can have them purchased sufficiently in advance of consumers' requisitions to permit of seasoning and treatment. Comparatively high stock accounts are wholly justifiable when it can be shown that all of the material carried in stock is accumulated against potential requisitions and to avoid substitution which will be expensive in terms of annual cost in service. First costs and carrying charges should always be subordinated to cost per year of service.

It is essential that the rate of consumption of forest products be known in advance, as well as the gross quantities needed. Maintenance and construction programs ordinarily can be approximated sufficiently in advance to enable supply organizations to provide the kinds and quantities needed at a rate which will avoid unnecessarily high stocks. Predetermined cross and switch tie monthly programs of insertion will enable purchase committments to be made for delivery at rates which will keep stocks of distributed ties within prescribed limits. The number of distributed ties on hand at any time should be in ratio to approximate consumption requirements, consequently stocks will vary considerably during the year, except for roads on which renewals are made throughout the year in approximately equal monthly installments. It is obvious that the minimum distributed supply that can be maintained without jeopardizing use programs should be considerably less approaching and during periods of little activity in track work than preceding and during periods of greatest activity. Since the rate of delivery of treated ties can usually be gaged more accurately than that of untreated ties, it is possible to safely carry proportionately fewer distributed ties on roads using a high percentage of treated wood than on roads which must depend entirely or principally on somewhat uncertain direct deliveries by tie producers.

Planning a Schedule for Procurement

A well-informed stores organization having knowledge of the approximate quantities of major requirements for forest products for which specific requisitions will be made upon it can intelligently plan a schedule of procurement and distribution. It will accumulate its stores in locations favorably situated with respect to natural movement of wood from point of production to place of consumption, enabling prompt and economical distribution without expensive backhaul. Wood in bulk for specific jobs will be moved directly to points of consumption, if for use untreated. Less than carload lots will be supplied from stores accumulated at a lower price basis than would be

*Presented before the annual convention of the Purchases and Stores division of the American Railway Association at Atlantic City, N. J., in June, 1924.

possible by the purchase of numerous small lots, and in less time. Forest products to be supplied treated will be acquired and stored in time to permit of thorough seasoning and preservation. Emergency purchases will be reduced to a minimum. Construction and renewals will not be held up for lack of material, nor will costly substitutions be necessary.

On some roads the distribution of cross ties is an almost virgin field for marked economies. Cross ties should never be distributed merely as "ties." Traffic, ballast, and topography of line to be served must be considered if the maximum service is to be obtained from every tie distributed. While it is appreciated that it is the function of engineers to determine what kinds and size of ties are needed for specific track sections, it is nevertheless a fact that a supply organization alive to its responsibilities can and does play an important part in laying down the right tie for the right track. Procurement and distribution will be so regulated that ties of the weaker woods capable of giving satisfactory service in tangent and light traffic tracks will not be distributed for service in curves or under heavy traffic where they will soon be destroyed mechanically; treated ties will not be furnished for use in tracks where, because of severe mechanical stresses, untreated ties will last as long; untreated ties will not be distributed for service where they will decay long before wear is a factor in their removal, nor will "main track" ties be supplied for a relatively unimportant branch where the track is "main line" solely because it is the only one on which trains operate.

Proper Precautions for Loading

Problems connected with the economical handling of forest products when they are received cannot be solved satisfactorily unless precautions are taken to have material loaded in such a manner that expensive sorting is unnecessary when the car is unloaded. Those who supply material naturally may be expected to load shipments most conveniently and least expensively unless purchaser's stipulations specify orderly arrangement. As a result of failure to establish and maintain definite practice in loading, consignees oftentimes are put to considerable expense in sorting and rehandling forest products at destination. The simplification of grades and sizes of lumber now approaching conclusion under the auspices of the Division of Simplified Practice in the U. S. Department of Commerce may be expected to lessen sorting and handling expense by a reduction in stock items which will be carried by railroads after the new standards are in effect.

The necessity for obtaining cross ties properly loaded on cars probably is most acute on eastern roads which purchase a variety of tie woods of different sizes. Single carloads of right-of-way acceptances are known to have contained 3 to 5 sizes each of 8 species of wood, for use untreated and after treatment. At a wood-preserving plant which recently received two cars of ties loaded the same day at the same place, enough Class U ties were sorted from among the Class T ties to make a full carload for shipment to a division point for immediate use. In addition to the cost of the backhaul on those ties, a considerable sum was spent for sorting which should have been done at the loading point, and at an inconsiderable cost. Purchasers should insist on the requirements of the A. R. A. standard specification for cross ties which provide that cross ties of different lengths, class, or group be loaded in separate cars whenever practicable. When that is impracticable all of each kind should be loaded in a car together. Ties for side and main track use should also be separated whenever practicable.

Shippers can be expected to resist loading requirements which will complicate their problems which they are apt to consider as unnecessary additions to their operating expense, but a careful analysis of all costs of handling at destination should be considered before forest products are accepted as they are produced, or after only partial sorting.

A storage yard layout should be planned and executed only after a careful analysis of the kinds and quantities of material to be stored. Haphazard provisions for the handling of bulky forest products in cramped space and with inadequate facilities are certain to be costly. Failure to provide a sufficient area on which to handle and store wood easily is not uncommonly resulting in extra labor and equipment costs which more than balance the apparent saving on restricted land use. Space for stacking each of the kinds of forest products received in mixed ladings should be provided along the same track and as closely together as practicable to minimize movement. Forest products which must be handled with the same kind of mechanical equipment should be kept in the same section of the yard.

Executive Officers Study Stabilizing of Forces

A THOROUGH INQUIRY into the practicability and the means of further stabilizing railroad work and employment with a view to avoiding, as far as practicable, the reduction of forces and of purchases in dull times, and of distributing the expenditures more equally between times of depression and times of prosperity, thus substantially aiding the stabilization of general business conditions, was instituted by the executive committee of the Association of Railway Executives at a meeting in New York City on September 18. It is hoped that the inquiry may develop results of far-reaching importance in the direction of reducing seasonal and periodical unemployment in the railroad service and in industries largely dependent upon railroad purchases, with consequent effects on general business.

A committee of ten prominent railway executives, headed by President Rea of the Pennsylvania, was appointed to make a thorough study of the subject in its various phases, to confer with the Interstate Commerce Commission with a view to obtaining its suggestions and assistance, and to report back to the executive committee. After a general discussion of the matter of making additional progress in stabilizing employment the executive committee adopted the following resolutions:

"Mindful of the continuing duty, under the law, of railroad managers to maintain economical and efficient management and operation, and recognizing that one of the most important factors in securing this result is the maintenance of skilled and permanent working forces, who enjoy, so far as possible, stable employment under proper working conditions, and commending the progress already made in this direction, the Association of Railway Executives, acting through its Executive Committee, hereby resolves:

"1. That, notwithstanding the necessity which unfortunately from time to time is forced upon the railroads to curtail purchases and reduce forces because of serious falling off in the volume of traffic or because of inadequate rates, resulting in meager and inadequate operating revenues, the railroads, in the continued effort to

promote economy and efficiency of operation and the best interests of their employees, and to contribute as largely as possible to the stabilization of general business conditions, hereby declare their purpose to enter upon an immediate inquiry into the practicability and the means of further stabilizing work and employment, and to seek a conference with the Interstate Commerce Commission upon the subject, in order to obtain its views as to the important accounting and financial problems involved and to enlist its sympathy and assistance in working out a practical and helpful result.

"2. That the chairman is directed to appoint a committee to make a thorough study of the subject, develop its various phases, confer with the Interstate Commerce Commission in respect to it, inviting its suggestions and assistance, and make report to the Executive Committee as soon as practicable."

The following committee was appointed to carry out this resolution:

Samuel Rea, president, Pennsylvania; Daniel Willard, president, Baltimore & Ohio; P. E. Crowley, president, New York Central Lines; C. R. Gray, president, Union Pacific; E. J. Pearson, president, New York, New Haven & Hartford; J. Kruttschnitt, chairman of the board, Southern Pacific; W. R. Cole, president, Nashville, Chattanooga & St. Louis; H. E. Byram, president, Chicago, Milwaukee & St. Paul; L. W. Baldwin, president, Missouri Pacific; L. F. Loree, president, Delaware & Hudson.

D. & R. G. W. Branch Line Changed to Narrow Gage

THE CHANGING of many miles of track from broad or narrow gage to standard in a few days' time was once a frequent occurrence, but those were feats of the dim and distant past and there are few men in railway service today who have any personal recollection of the "battle of the gages" and of the Herculean work which the change to standard involved as the various railway managements became convinced of the imperative need of a uniform track gage throughout the length and breadth of the American continent. For this reason unusual interest is attached to a change of gage operation completed in eight hours' time on the 46.5 miles of the Farmington branch of the Denver & Rio Grande Western. But what is more unusual is the fact that the change was from standard gage to the narrow gage of three feet.

However, the reason for the change becomes obvious with an understanding of the relation of the Farmington branch to other portions of the Denver & Rio Grande Western system. This branch line extends north from Farmington, N. M., to Durango, Colo., which is also the southwestern terminus of the narrow gage main line extending southwestward through Alamoso, Colo., and Antonio from Salida where it joins the main standard-gage lines of the railroad. Because the branch line had been built to standard gage all transportation over it involving movements over the narrow gage main line east of Durango necessitated the transfer of the lading from narrow gage cars to standard gage, or vice versa, at that point. This led to the decision early in the present year to change the gage on the branch to conform with that of the main line, and, as in all other projects of this character, it was highly necessary to do the work in the shortest possible time to avoid a serious interruption of traffic.

The work of carrying out the change of gage was done by a force of 250 men which was organized by assembling all of the section men between Alamosa on the main line and Farmington at the end of the branch, a distance of 247 miles, in addition to two small extra gangs. The use of the section forces on this work was of particular advantage because it insured an adequate supply of foremen to supervise the work. General supervision was also provided through the detailing of six roadmasters and a superintendent to this operation.

The track men used on the work were picked up with their tools and bedding by a special train that arrived in Durango on Monday evening, where arrangements had been made with a local restaurant to feed the men and provide lodging for them. Each morning during the course of the work a work train was run out of Durango to distribute the men over the length of the branch, where they were employed in cleaning off the track where the rails would rest after the change of gage had been made. By the use of gages the ties were marked where the inside spikes would be driven and six or eight of these spikes were driven about half way down in each rail length. In addition, a portion of the spikes on the rails were pulled, leaving just enough to hold the gage for the safe operation of trains until the change was made. This work required three days.

On Friday, the preliminary work having been completed, arrangements were made with farmers at intervals of about five miles along the line to provide the men with board and lodging. Owing to the lack of sufficient accommodations many of the men were required to sleep in barns or other out-buildings, but being provided with their own bedding this involved no particular hardship. On Friday afternoon at points where no switching was to be done that day, the track forces changed the location of frogs so that they would be in the proper location after the gage of the track was changed. That evening the last standard-gage train was run over the branch and all standard-gage equipment was moved into Durango and released via the standard-gage tracks of the Rio Grande Southern, extending northwesterly to a junction with the standard-gage tracks of the Denver & Rio Grande at Ridgway.

Change Made in Eight Hours

Preparations were also completed for the actual change of gage to be made on the following day by organizing the force into eight gangs of approximately 30 men each, placing a roadmaster or other supervising officer in charge of each unit. Instructions were issued that as early as possible on Saturday morning they would start making the gage change. This plan was carried through without a hitch and eight hours after the actual work was started each gang had completed the change of gage to a point where it joined the section of track assigned to the adjacent gang and the change from standard to narrow gage was completed. The work was carried on without any means of communication between the gangs owing to the lack of any available telephone service.

On the following morning a narrow gage work train was run out over the branch and wherever the rail was too tight on account of the change of gage on curves, the necessary cuts were made, the rail drilled and each joint fully bolted. The men in the different units were then picked up and carried back to Durango and dropped off at their various headquarters on the main line. Full spiking and other finishing touches that could be postponed until after the resumption of train service was carried out by the regular section forces on the branch during the following week.

We are indebted for the above information concerning this work to A. C. Shields, engineer maintenance of way of the Denver & Rio Grande Western, Denver, Colo.

The Convention Was Well Attended

Bridge and Building Men Meet at Kansas City

Thirty-Fourth Annual Convention Was Largest Attended in History of Organization

MORE THAN four hundred members of the American Railway and Building Association and members of their families were present at the opening session of the thirty-fourth annual convention, when it was called to order in the Baltimore Hotel on Tuesday morning, October 21, by J. S. Robinson (C. & N. W.), president. After invocation by C. A. Lichty (C. & N. W.), secretary of the association, J. F. Holden, vice-president of the Kansas City Southern, welcomed the convention to Kansas City. After reviewing the attractions of the city Mr. Holden impressed upon those present their responsibility in educating those with whom they come in contact regarding the problems now prominently before the American people, particularly as they affect the railways. He cited the experience in operating the railways under federal control during the war and the greatly increased efficiency of operation of the roads since their return to private control as an indication of the relative results which might be expected if the roads were again taken over by the government. J. P. Wood (P. M.), first vice-president of the association replied to Mr. Holden's greetings in behalf of the association.

The report of C. A. Lichty, secretary-treasurer, showed a present membership of approximately 770, in addition to which approximately 50 new members were elected at this meeting.

The making of good concrete was the subject of an illustrated address by H. C. Boyden, representative of the Portland Cement Association, Chicago. While pointing to the great economies which have been effected through the invention and development of Portland cement, he stressed the fact that certain precautions must be rigidly followed if good concrete is to be made from this valuable material. He discussed the various elements in the making of concrete which affect its strength and durability, illustrating his talk with slides showing the manner of grading and aggregates, the determination of consistency by the slump test and other measures developed to check the quality of the resulting product.

J. V. Hanna, chief engineer of the Kansas City Terminal, described the bridge work required in the reconstruction and enlargement of the property in connection with the Union station project completed in 1914. Those who heard Mr. Hanna were afforded a good opportunity to see many of these structures in the course of an inspection trip over the terminals on Thursday afternoon.

Two other features of the program were an address by John Lyle Harrington, consulting engineer, Kansas City, on the effect of maintenance on the design of railroad bridges, and a paper by G. H. Trout, bridge engineer, Union Pacific System, Omaha, Nebr., on the construction of the Columbia River bridge near Kennewick, Wash. Mr. Harrington reviewed many of the moot points of bridge design, pointing out the considerations to be taken into account and the influence which maintenance exerts in arriving at the decision with respect to such matters as the relative merits of pin connected and riveted trusses, the type of foundation method to be used, etc. The decision is also influenced largely, he said, by the financial condition of the railway for a company with plenty of money can build better than one in straitened circumstances. Mr. Trout's description of Columbia River bridge problems is published elsewhere in this issue.

The annual dinner of the Bridge and Building Association and the Bridge and Building Supply Mens' Association, was held on Wednesday evening with approximately 325 percent. Among the features of special interest was an illustrated lecture on the Grand Canyon of the Colorado River by R. C. Moore, Professor of Geology at the University of Kansas, Lawrence, Kansas, who was a member of the party of government employees which made a trip through the canyon by boat last year.

The Members and Visitors Numbered About 325

The officers of the association during the past year have been as follows: President, J. S. Robinson, division engineer, Chicago & North Western, Chicago; First Vice-President, J. P. Wood, supervisor of bridges and buildings, Pere Marquette, Saginaw, Michigan; Second Vice-President, C. W. Wright, master carpenter, Long Island Railroad, Jamaica, N. Y.; Third Vice-President, Elmer T. Howson, editor, *Railway Engineering and Maintenance*, Chicago; Fourth Vice-President, F. C. Baluss, engineer of bridges, Duluth, Missabi & Northern, Duluth, Minn.; Secretary-Treasurer, C. A. Lichty, inspector, purchasing department, Chicago & North Western, Chicago; Assistant Secretary, F. E. Weise, chief clerk to chief engineer, Chicago, Milwaukee & St. Paul, Chicago; Members Executive Committee: S. T. Corey, assistant bridge engineer, Chicago, Rock Island & Pacific, Chicago; W. B. Hotson, superintendent, bridges and buildings, Elgin, Joliet & Eastern, Joliet, Ill.; P. N. Nelson, supervisor bridges and buildings, Southern Pacific, San Francisco, Cal.; J. S. Huntoon, assistant bridge engineer, Michigan Central, Detroit, Mich.; A. I. Gauthier, supervisor of bridges and buildings, Boston & Maine, Concord, N. H., and E. L. Sinclair, assistant engineer, Chicago, Milwaukee & St. Paul, Marion, Ind.

R. H. Aishton Emphasizes Importance Of Association Work

R. H. AISHTON, president of the American Railway Association, addressed the convention at its opening session on Tuesday morning in part as follows:

"This is the thirty-fourth annual convention of the American Railway Bridge and Building Association. Thirty-four years of striving to one end must most surely bring results.

"Your dockets in the early years carried discussions on the relative merits of surface cattle guards as compared to pit guards, whether or not it was advisable to sharpen piles before driving them and discussions on the superiority of cast iron sewer pipe over vitrified pipe.

"I talk to you today with a full realization of the complexing duties of your position. I can not concede to anyone a more full appreciation of what the title of superintendent of bridges and buildings implies, for in the period which I have just sketched I can truthfully say that I gloried in the title of assistant superintendent of bridges and buildings.

"The title of superintendent of bridges and buildings covers a multiplicity of duties which the title may not indicate. With responsibility to superior and subordinate, to the shipping and traveling public, he must also be a good workman and a competent judge of workmanship in metal, wood and stone. He must, by his ability and the exercise of good judgment, deserve the confidence of his superiors and demand the respect of his subordinates. He is practically unkown to the shipping and traveling public, yet it is through the fulfillment of his duties that confidence is instilled in the traveling and shipping public as to the safety of the structures over which they ship or travel. Since confidence in the safety of a road is the dominating factor in travel and an influencing factor in routing commerce, you can readily see that your work is a silent solicitor for your respective lines.

"Thirty-one years ago a wonderful exhibit of transportation was on view at the World's Fair at Chicago, yet if that exhibit were intact today it would more serve as a museum relic than as an exhibit of efficiency. Such is the advancement of transportation within our memory. This advance is not the result of any one invention or any one man's work. It is due in no small measure to the co-operation of bodies such as yours in developing by discussion in open meeting the best practice in each individual phase of transportation. We have seen the strides made in the past and we can confidently look forward to the future. As long as the railroads have associations and personnel such as yours they have the foundation upon which they may build for the future with every confidence that the structure built upon such a foundation can not fail."

Mr. Aishton concluded his address by reviewing the disturbed conditions through which the railways have passed since their return from federal control, including the coal strike, the shop crafts strike and the wide fluctuation in traffic. In spite of these difficulties the roads were able to move the heaviest volume of traffic in their history without a car shortage of consequence last year, and this performance is being repeated this year. The shippers have seen that the railways can render adequate

service if left to themselves and their attitude has become one of friendliness. The public in general is, however, interested also in knowing whether the roads are being operated efficiently and economically, and Mr. Aishton stated that associations such as the Bridge and Building Association can render no greater service to the railway industry of the country than by concentrating its attention on the subjects which will promote efficiency.

Report on Placing Concrete in Winter

CONCRETE has been placed successfully in winter for so many years that winter concrete work has come to be generally regarded as entirely feasible, as evidenced by many recent instances on well known railway projects. Much of the concrete work for the piers of the Castleton bridge of the New York Central over the Hudson river south of Albany, and for the long concrete culverts nearby, was placed during the winter of 1922-23. The Long Island placed over 10,400 cu. yd. of concrete on its Queens track elevation work between Dec. 1, 1923, and March 31, 1924. Concrete was placed in the piers and abutments of the Big Four railway bridge at Sidney, Ohio, during the first three months of 1923, when the temperature was frequently below freezing. A 6-ft. by 6-ft. culvert 128 ft. long was built by the Canadian National railway at Endako, B. C., in November and December, 1922, when the temperature ranged from 20 deg. F. above zero to 53 deg. F. below. At such low temperatures the cost of protecting the concrete is high and concrete work would not ordinarily be undertaken, but this instance shows that concrete structures can be built successfully in extremely cold weather.

Winter Temperatures Are Usually Not Severe

Study of the temperature records in northern cities shows that in most places the spells of severely cold weather are short and that on the great majority of days the temperature during working hours is but little, if any, below the freezing point. During the winter of 1922-23 the temperature at Chicago dropped to zero on only 6 days. There were only 12 additional days when the temperature was as low as 10 deg. above zero. On all of those days the temperature during working hours was 5 to 30 deg. above those minima. The first touch of freezing weather was on November 20, the last on April 14. Between those dates were many periods of one or two weeks when the temperature was generally above the freezing point.

In view of the relatively small amount of severe weather it hardly seems logical to close down construction for five or six months when concrete can be placed conveniently during the entire period, with the possible exception of a few short cold spells. On stormy days actual placing of concrete, or if necessary all work, can be suspended, the same as in summer work. The weather bureau forecasts the temperature for 36 hr. in advance with surprising accuracy. With such ample warning of the approach of storms and cold spells, full preparations can be made to meet them.

Disadvantages of Winter Work Are Minor

Winter work has certain disadvantages. Cold weather may retard construction progress. On very cold days men cannot work efficiently outdoors. Concrete materials must be heated and freshly placed concrete must be kept warm the first few days. These features add somewhat to the cost of concrete work.

These are disadvantages, but are they as severe as commonly supposed? Daily temperature charts show a few spells of very cold weather lasting a week or less, often only a day. In severe weather the cost of heating the materials and keeping the freshly placed concrete warm may be excessive and the efficiency of workmen may be low, but such weather is infrequent and when it occurs the actual placing of concrete, or if necessary, all work, can be suspended for a few days. During the remainder of the winter in most states the weather is relatively mild: on most days the temperature during working hours is but little, if any, below freezing. It is hardly advisable to stop work for several months because of the possibility of a few spells of very cold weather, each lasting only a few days.

The recent report on "Seasonal Operation of the Construction Industries" of a committee of the President's Conference on Unemployment states: "With due precautions and proper equipment nearly all construction work can be carried on in winter and at no great difference in cost . . . the cost in winter, especially under first class management, may be actually less than the cost at other seasons."

Winter Shut-Down Is Due to Custom, Not Necessity

The real reason for the winter shut-down of construction appears to be not a matter of desirability, feasibility or economy, but a matter of custom and psychology. The annual winter curtailment of construction work in southern states and on the Pacific Coast, where winter weather is generally almost as favorable as summer weather along the Canadian border, is purely a matter of custom and habit.

A generation ago but little machinery was used in placing concrete, or in any construction work. Heating appliances consisted mainly of inefficient, dangerous, open fires. Large gangs of men could not be handled well in cold weather. Modern methods of placing concrete utilize clam shell buckets, power driven mixers, motor trucks and chutes. Power of one or more types, electric, gasoline or steam, is available on nearly every project. Greater use of machinery and equipment in handling materials and in mixing and placing concrete has reduced the man power necessary to place a cubic yard of concrete 50 to 75 per cent. The efficiency of machines is decreased but little if at all by cold weather. Conditions have changed: the old difficulties in winter work have largely been removed.

But railway officials and the public generally do not fully realize the extent of these improvements or their effect on winter concrete work. When it is generally understood that concrete can be placed as efficiently and economically in winter as in summer, executives will soon appreciate the advantages of a 12-month working year and better progress will be made toward a more uniform and economical construction program.

Advantages of Winter Work

The committee believes that winter concrete work has five decided advantages: first, less interference with operation; second, possible lower prices of materials; third, year-around use of capital investment in construction equipment; fourth, less labor turnover, more efficient labor, better supervision and improved morale; and, fifth, earlier completion and use of needed improvements.

It is well known that railway traffic is lowest early in the year, reaching a peak in September or October.

More railway construction during winter months would relieve the October peak in car loadings, giving more uniform distribution of traffic through the year. It would also stimulate more winter concrete work by industries, governmental bodies and individuals, thus helping to develop more railway traffic in the slack winter season. Furthermore, winter concrete work means minimum interference of construction work with operation.

Lower Prices of Materials

Prices of construction materials are apt to be lower in winter than in summer. Manufacturers often reduce prices in order to stimulate purchases. At Chicago, for instance, the price of reinforcing steel was 12 per cent lower in winter than in summer, and form lumber was 11 per cent lower. At New York sand was 20 per cent lower in January than in July, reinforcing steel was 14 per cent lower, and form lumber 8 per cent lower. It is obviously desirable to take advantage of these lower prices where possible.

Another important factor in obtaining materials is prompt delivery. In the peak of the construction season materials are often hard to get. Work must sometimes cease for days or weeks waiting for delivery of needed supplies. Delivery delays add materially to the cost and time of construction. In winter these delays are greatly reduced. Materials of proper quality can readily be delivered on time.

Another feature fully realized by contractors but sometimes not appreciated by railways is the advantage of year-round use of construction equipment. Rental of equipment is often an important item in construction costs. Such charges per day, or per cubic yard of concrete placed, and the capital investment in equipment, are much less when the equipment is working 12 months than when it is working only 6 or 8. If a contractor can work steadily through the year, his equipment costs per unit of work are lower.

J. S. Robinson
President

Less Labor Turnover

Seasonal employment is a reproach to modern civilization. Why force men to work overtime in August and then lay them off in November? Railway traffic was heavy and more uniform than usual in 1923. Nevertheless, there were 11 per cent more railway employees in August, 1923, than in either January, 1923, or January, 1924. Over 150,000 railway employees, largely from construction and maintenance forces, were laid off for the winter season.

Union wage scales and railroad wage rates do not fluctuate during the year, but unit labor costs vary appreciably. In summer months men are usually scarce; on contract work, bonuses, overtime and similar devices are often adopted in order to attract and retain workmen. In the slack winter months such devices are not necessary. Moreover, when jobs are scarce, morale improves: men work harder and there is less friction. Even if wage rates per hour or per day are the same in winter as in summer, unit labor costs per yard of concrete are apt to be lower.

The desirability of a year-around construction and maintenance program in track work was brought out in an editorial on page 474 of *Railway Engineering and Maintenance*, for December, 1923. Many of the ideas apply with equal or greater force to bridge and building work.

A better grade of workmen can be obtained for winter than for summer work and a still better grade for work that lasts continuously through the year. On contract work non-union men can sometimes be employed at lower rates in winter than in summer, resulting in an appreciable saving.

Earlier Completion of Needed Work

In railway work early completion and use of structures is frequently essential. Where the work is done under traffic each day's delay adds to the cost of maintaining traffic. On a fair size job the cost of slow and stop orders, temporary tracks, etc., may amount to $30 a day, while on large jobs the cost may be much higher. Earlier completion also means a saving of "interest during construction," which on a $100,000 project at current rates of interest amounts to $500 a month.

Again, assuming that the improvement will have an annual earning power of 10 per cent of its cost, and most railway improvements today must earn that much or more to be authorized, completion six months earlier means an increase in earnings equal to 5 per cent of the cost of the improvement. On a $100,000 project the several savings due to earlier completion may amount to $10,000.

On most railways, peak traffic comes in September and October. Improvements should obviously be completed, whenever possible, for use during that traffic peak, when they are needed most. If a project requires over six months for construction, and many require a year or more, it should be started the previous winter if maximum benefits are to be secured.

Conclusions

From the foregoing study of this subject the committee has reached the following conclusions on "Placing Concrete in Winter":

1.—Concrete can be placed successfully regardless of the temperature if proper methods are used.

2.—Where temperatures seldom fall to zero, concrete can be placed efficiently and economically all through the winter with only a few interruptions due to severe weather.

3.—The extra cost of protecting concrete in cold weather on railwork is usually less than 5 per cent.

4.—The economies of winter work due to lower prices of materials, more efficient labor, and freedom from material delays, usually offset the cost of protection and may show a net saving.

5.—The advantages of better distribution of traffic, less interference with operation, continuity of employment, improved morale, better supervision, possible lower construction costs, and earlier use of needed improvements, make a 12-month program of concrete work highly desirable.

Supplementary to its report and for the use of the newer supervisors and foremen the committee presents, in Appendix A, information on the action of concrete in hardening, the effect of frost thereon, and approved methods of handling concrete work in cold weather. Appendix B contains a partial list of articles and books bearing on this subject that have been published in the last few years.

The report was signed by F. P. Gutelius, Jr., Chairman, (D. & H.); T. H. Strate, Vice Chairman, (C., M. & St. P.); D. A. Tomlinson, (Port. Cement Assn.); E. L. Goldsmith, (L. I.); D. H. Dickerson, (D. & I. R.).

Discussion

The report was presented by T. H. Strate, vice-chairman. He said in explanation of the report that it was not the idea of the committee to favor the doing of small concrete repair work in the winter, but that the conclusions of the report were directed primarily to work of considerable volume. He reviewed his own experience with concrete work carried on in connection with double tracking in Minnesota and South Dakota, where good results were obtained with winter work.

E. L. Sinclair (C. M. & St. P) stated that it was his experience that much better results were obtained with labor during the winter months. Work is then scarce and men are glad to have employment and will work harder to hold their jobs. President Robinson was not inclined to agree entirely with this, citing the experience of a contractor on some work on the Chicago & North Western, on which there was virtually a complete turnover of the force once a month. Mr. Strate said that he experienced no such difficulty on winter work in connection with track elevation in Chicago.

F. C. Baluss (D. M. & N.) said that the holding of men in cold weather was largely a matter of the accommodations provided for them. It was his experience that if they were properly housed they would stay on the work. W. T. Krausch (C. B. & Q.) described the work on a large new freight house of the Burlington in Chicago, which involved the construction of 520 caissons, 90,000 cu. yds. of floor slabs and 50,000 cu. yds. in columns and girders. The complexity of this work made it desirable to employ a permanent force in order that the men could be properly trained in the work, and continuation of the work throughout the entire year was an important influence to this end. However, he felt that those responsible for concrete work should exercise caution and avoid attempting to continue the work when the weather gets too cold.

Garrett Davis (C. R. I. & P.) reported that he obtained good results in winter concrete work on a bridge near St. Paul. Winter work, he said, has one advantage over summer work, in that the concrete does not dry out as rapidly and it is not necessary to exercise as much care to keep the concrete wet during the process of curing. J. H. Markley (T. P. & W.) reported good results with concrete for a bridge across the Illinois river. The concrete was protected by conducting steam pipes around the forms and keeping the heat in with tarpaulins.

C. A. Lichty
Secretary-Treasurer

F. E. Weise
Assistant Secretary

The Fire Hazard of Treated Timber

BY C. S. HERITAGE
Bridge Engineer, Kansas City Southern

SINCE our annual timber consumption is rated at four and one-half times that which is replaced by growth, it is becoming increasingly necessary to conserve what remains of the nation's supply of timber for our future requirements. Wood preservation presents one of the important channels through which conservation can be assisted. The use of treated timber is enormous and will become greater so the subject of the fire hazard of this class of material is increasingly important.

The great bulk of treated timber is treated with zinc chloride or creosote oil. Of the fire hazard of timber treated with zinc chloride, H. M. Rollins, vice-president of the Gulfport Creosoting Company, states that zinc chloride is deliquescent in its nature, absorbing moisture from the air quickly and therefore is not very combustible. The presence of zinc chloride in timber fireproofs it to a great extent. Any attempt to burn timber treated with zinc chloride will quickly demonstrate that it is less combustible than a similar piece of untreated timber. Zinc chloride enters largely into the make-up of fireproof compounds and a knowledge of its properties will convince anyone that its presence in timber decreases the inflammability.

For railroad purposes, the use of zinc chloride treatment is confined largely to ties, which do not constitute much of a fire hazard after they are placed in the track. Even when ties are piled on the right-of-way, the loss from fire will be small as compared with large structures, as the fire can usually be confined to a few piles. Also, a fire of this nature does not interfere with railroad traffic as in case of a bridge fire.

Bridge and structural timbers, when treated, are nearly always creosoted. Therefore, the fire hazard of creosoted timbers is of the most importance.

An interesting series of tests was made by Dr. Hermann von Schrenk, consulting timber engineer, St. Louis, Mo., some years ago to determine the relative inflammability of creosoted red oak ties as compared with untreated white oak ties, the inflammability of both of these timbers being about the same in the untreated state. A large fire was built of coals and several scoopfuls were thrown on the piles of creosoted red oak ties and on similar piles of untreated white oak ties. Both took fire quickly, but, after burning about 10 minutes, the fire in the creosoted red oak ties went out, while the white oak ties burned so fiercely that it was with the utmost difficulty that the fire was extinguished. Tests of this sort, conducted at various points throughout the middle west, gave the same results in each case.

In order to obtain definite information as to the relative inflammability of creosoted and untreated timber, a number of tests were made, using an electric inflammability furnace (see Proceedings N. F. P. A., 1915, page 133). Five panels of air-dried untreated yellow pine, five of kiln dried and seven creosoted panels were tested. Of the latter, five were tested 7 months after treatment and two 18 months after treatment with approximately 30 lb. of creosote oil per cu. ft. The panels tested were all yellow pine and were all cut from the same board. All panels were subjected to the heated plate, the temperature of which was 450 deg. C. (842 deg. F.), for six minutes after ignition and then moved to the back of the apparatus, where they were allowed to remain six minutes longer.

The results obtained from these experiments were as follows:

Average time of ignition—

Untreated blocks	2 min. 4 sec.
Creosoted blocks	5 min. 4 sec.

Average time of burning after igniting until the fire went out—

Untreated blocks	20 min. 8 sec.
Creosoted blocks	23 min. 36 sec.

Percentage of timber consumed when fire was out—

Untreated blocks	32.76 per cent
Creosoted blocks	21.70 per cent

That is, it required about 2½ times as long for the creosoted timber to ignite as it did for the untreated timber, while the amount of untreated timber burned before the fire went out was about 1½ times the amount of creosoted timber burned. The conclusion drawn from this test is that timber which has been creosoted for six months or more is ignited with more difficulty and is less combustible than similar timber in the untreated state.

Arthur M. Shaw contributed a paper to the Louisiana Engineering Society, published in the proceedings of that organization for October, 1922, on the subject of the Reduction in the River Front Fire Risk, in which he described the destruction by fire of a wharf in New Orleans. His conclusions on the behavior of the creosoted timber are as follows:

"1.—Creosote treatment, if followed by a few months of seasoning, increases the ability of wooden members to resist ignition and retards burning after ignition.

"2.—Excepting where conditions are favorable for further burning (such as a strong wind and exposure to other burning members) fire in creosoted timbers of heavy section will go out even after it has made considerably headway.

"3.—Continued intense heat causes creosoted materials to give off a gas which is inflammable and which may aid in the spread of fire after it has reached an advanced stage. The burning of this gas, and of the oils exuded by heated timbers, causes a more dense smoke than burning untreated timbers.

"4.—The amount of oil and gas which will be given off by creosoted timber varies with the intensity and length of time of application of the heat and inversely as the degree of seasoning.

"5.—Creosote treatment does afford substantial resistance to burning in a small fire or in any fire during its early stages but may add to the danger of communication to other materials as the fire reaches a more advanced stage."

J. P. Wood
First Vice-President

C. W. Wright
Second Vice-President

E. T. Howson
Third Vice-President

F. C. Baluss
Fourth Vice-President

* The Kansas City Southern has had some disastrous fires on open deck creosoted trestles. On April 14, 1915, bridge A-225, a 330-ft. trestle from 12 to 20 ft. high, was ignited by fire dropping on the structure from a defective locomotive. The fire spread rapidly and the bridge was almost entirely consumed. This bridge was of freshly creosoted timber. Bridge A-477, 1,320 ft. long, was almost entirely burned Feb. 14, 1918. This bridge also had an open deck of new freshly creosoted timber. Bridge A-765, a 630-ft. open deck trestle about 25 ft. high, was burned on June 13, 1918. This timber had been creosoted about two years. The deck was entirely destroyed and the piles were so badly burned that most of them had to be cut out and replaced with frame bents. There is no reason to believe, however, that fires of a similar nature on untreated bridges would have been any less disastrous.

* Mr. Heritage also commented on the limited damage suffered by creosoted trestles on the Nashville, Chattanooga & St. Louis and the Southern Pacific after severe fires, which were covered in *Railway Engineering and Maintenance* for September, 1921, page 335, and April, 1923, page 156, respectively.

Left to Right—The Santa Fe Provided a Special Train From Chicago to Kansas City. Congratulating the Engineer at the End of a Successful Run. The Special at Marcelon

It is likely that these fires would not have occurred on ballasted deck structures.

In September, 1922, bridge B-480, a 525-ft. creosoted open deck trestle, 13 years old at the time, ignited and was burning freely. The fire was extinguished after five or six hours and only 10 out of the 50 panels had to be replaced. In 1910, bridge A-103, a creosoted trestle 200 four or five hours. After the fire was extinguished traffic was resumed over the bridge without any repairs being made. Later the bracing and part of the deck was replaced, but the piles, caps and stringers remained in service almost nine years more, until the bridge was replaced with a steel girder. This bridge at the time of the fire had a solid, gravel-covered deck.

In 1915, the Kansas City Southern had a large bridge fire that is of interest in this connection. The 1,360-ft. trestle approach to the Poteau River bridge, on the Fort Smith branch, was ignited and burned for several hours. This bridge was of untreated pine, but creosoted piling for a new structure had just been driven between the old bents. About 55 of the 119 panels were burned out and several more panels badly charred. In this fire the untreated piling was practically consumed by the fire, while the creosoted piles suffered much less damage.

Poles and Fence Posts Are Frequently Exposed to Fire

There has always been a considerable loss of fence posts by fire, the fence posts usually igniting from burning grass. I have not been able to gather much statistical data as to the relative number of creosoted and untreated posts burned, but, from the experience on our road, I am convinced that the fire risk is materially less with creosoted posts than with untreated posts. The Missouri-Kansas-Texas furnished data as to the burning of fence posts on its lines for the years 1920 and 1921 which appeared in a committee report of the American Wood Preservers' Association presented at its annual meeting in 1923. Of more than 2,000,000 fence posts, 18.7 per cent (or approximately 378,000) were creosoted. Of the 5,871 posts destroyed by fire during the period only 76 of them were creosoted posts. The percentage of untreated posts burned to the total number of untreated posts was 0.35 per cent, and of the creosoted posts, 0.02 per cent.

The use of creosoted telegraph and telephone poles is growing, and the following, taken from a report of the American Telegraph & Telephone Company on poles in a line between New Orleans and Mobile, gives some facts on fire resistance. This line was constructed in 1899 of creosoted pine poles and was inspected in 1906, seven years later. Many of these poles were set in a swamp where grass and weeds grow to a height of 20 ft. When dried these weeds and grasses burned so fiercely that the glass insulators cracked and the copper wire on the poles annealed. In the section of the line examined in 1906, 2,152 poles were examined. Eleven were found slightly burned and three badly burned. The report also states that as compared with untreated poles, fire seems to have small effect on creosoted poles and that a parallel telegraph line of juniper poles exposed to similar conditions suffered to a much greater extent.

We have a considerable mileage of creosoted telegraph poles on the right-of-way of the Kansas City Southern, none of which have ever been damaged by fire from burning grass although many of them have been subjected to this condition. We have a creosoted telegraph pole in Texarkana which was exposed to a big fire in a lumber yard on April 22 of this year. There was a large pile of lumber near the pole in question. The fire was so hot that the telegraph wires were melted and cross arms were burned off. About 18 in. of the top of the pole burned off, but the remainder of the pole was only charred and was continued in service after new cross arms were put on. Our superintendent of telegraph believes that an untreated pole exposed to similar conditions would have been entirely consumed.

Conclusions

The conclusions I have reached from the information obtained are that after creosoted timber has seasoned so that the more volatile oils have evaporated, the fire hazard is much less than for freshly creosoted timber and that the fire hazard of creosoted timber which has seasoned for six months or more is less than for untreated timber, and decreases somewhat as the seasoning continues.

One important feature that makes creosoted timber safer than untreated timber with respect to fire risk is the ease with which untreated timber will ignite when fire comes in contact with any decayed parts. Even when untreated timber is sound, it is more easily ignited than seasoned creosoted timber. Another feature to be considered in connection with the burning of creosoted timber is the fact that the fire will burn for a considerable period while being fed on the creosoted oil without consuming much of the timber. This condition gives more time to organize for fighting of a fire.

It must be recognized that in a large fire of creosoted timbers, the oil as well as the timber will be burning and it is possible to have a fire that is hotter and more difficult to control than a fire of untreated timber and at the same time it may be consuming less timber.

From the fact that creosoted timber is combustible, and the loss of a creosoted structure is greater than for a similar untreated structure, it is of utmost importance that creosoted structures should be designed and built so as to reduce the fire hazard as far as practical and further that reasonable means should be provided for fighting the fire after it does get started.

Investigations as to the cause of fires on railway

Left to Right—Tom Lehon Clinching an Order. The Retiring President Congratulating the President-Elect. The Santa Fe Believes in Creosoted Ballasted Decks. Chief Engineer Hannah of the Kansas City Terminal Described this Work.

trestles indicate that 90 per cent of these fires are caused by sparks falling on the deck, usually from locomotives. For this reason the ballasted deck trestle is one of the best preventives of fires. If open deck trestles are used, some protective covering is recommended. Sand used on top of creosoted ties and other exposed timbers has been found to be quite effective. Neat cement has also been used for this purpose. Sheet metal coverings are also used frequently. In addition to a reasonable amount of protection on the deck of trestles, it is important to keep the ground underneath and around the ends of the trestles cleaned of dry grass and weeds.

Sand or cement is sometimes used on top of freshly creosoted ties on open decks of steel bridges.

All timber bridges on railways should be provided with some simple form of fire fighting equipment. This is usually in the form of water barrels set at intervals along the bridge. For creosoted structures sand boxes with water tight covers for keeping the sand dry are recommended, dry sand being more effective than water for extinguishing small fires on creosoted structures.

On very long trestles, it is advisable to have fire barriers at intervals to check the spread of a fire and confine it to one section of the trestle. This can be effected by inserting a few panels of concrete trestle or by putting in a concrete pier, with wings projecting beyond the sides of the trestle, to replace one of the bents at desired locations. When practical, it is desirable to divide very long trestles into shorter sections by filling a few panels.

Where timber roadways are used on steel bridges, they should be designed to retard the fire all possible. Creosoted blocks on a concrete base are practically fireproof. If the blocks are laid on timbers or on a sub-floor of timber plank on stringers, the space between the stringers over the floor beams should be blocked off to prevent a draft through these openings and to retard the spreading of the fire underneath.

On long docks and wharves, fire walls should be placed at suitable intervals and these walls should extend down to low water mark to prevent the spreading of the fire underneath the structure.

Creosoted ties piled on the right of way should be covered with earth to prevent their ignition from sparks.

Owing to the increase in use of treated timbers, especially creosoted timbers, it is very desirable that more extensive investigations be made to determine more exactly, the relation of the fire risk of creosoted timber as compared with untreated timber.

Discussion

This paper, which was presented on Tuesday evening, brought out a very active discussion. I. L. Simmons (C. R. I. & P.) stated that fire losses in creosoted trestles on the Rock Island from 1913 to 1923 amounted to $121,000. Eliminating losses due to incendiarism, the net loss due to all other causes was $93,000, or about $8,000 per year. This represents losses due to all fires in 321,000 ft. of timber bridges on the Rock Island, of which about one-third consists entirely of creosoted material throughout, one-third contains about 50 per cent of treated timber, and the remaining third is largely untreated material with a small amount of treated material used in repairs. The average annual losses in the period above named were practically the same as those of the years 1906 to 1910, when the volume of treated material in the structures was far less. Since the structures in service today are composed much more largely of treated timber and, therefore, represent a much greater investment, and as fire losses are in some measure, at least, proportionate to the traffic, this comparison indicates that the average annual fire loss in creosoted trestles represents a much smaller percentage of the structures. He agreed with Mr. Heritage that the greater cost of structures built of creosoted timber justifies more elaborate measures for their protection. He favored sand boxes as being more effective than water barrels.

George Rex (National Lumber & Creosoting Co.) read a letter from C. A. Morse, chief engineer of the Rock Island, confirming the statements made by Mr. Simmons.

George Rear (S. P.) stated that the Southern Pacific had used creosoted timber for 31 years and that there are now in its lines 600,000 lin. ft. of creosoted timber trestles and several million dollars worth of docks and wharfs constructed of this material. The danger of fire on the Southern Pacific, is, of course, less because oil burning locomotives eliminate the danger from sparks, and this fact must be taken into consideration in considering the record of the Southern Pacific with respect to fire losses, which amount to only about $800 or $900 per year. However, it clearly indicates that the hazard from the use of the material is extremely low. He offered another illustration of the behavior of creosoted material in a fire in the case of a $300,000 structure which burned for three hours, the fire being put out eventually by the use of 60 streams of water. On subsequent examination, it was found that the damage to the structure did not exceed $1,000.

C. M. Taylor (P. & R.) felt that the question of fire hazard from creosoted material has already been so definitely settled that he did not see the necessity for any further discussion of it. He is strongly of the opinion that untreated timber involves greater fire hazard than treated timber. The reverse is true only during the first six months of the life of the structures. After the first half year, the hazard in the creosoted structure is far less. In his opinion, one reason for some trouble with creosoted structures is due to the ill-advised practice of using too much oil in the treatment.

A number of speakers cited measures which may be taken to decrease the danger of fire. F. T. Darrow (C. B. & Q.) cautioned against allowing chips and other refuse to accumulate around the structure during construction.

J. P. Wood (P. M.) expressed the opinion that the use of ballast decks has greatly reduced the hazard, while J. S. Huntoon (M. C.) favored the use of sheet metal coverings over bridge decks as a means of protecting the structure against falling sparks.

C. R. Knowles (I. C.) said that the creosoted water tanks constructed on the Illinois Central have proved to be no worse fire risks than the untreated tanks. The first creosoted tank was erected in 1916. Its loss from tank fires during that year was $3,035 and, although 25 or 30 creosoted tanks were erected in 1917 and 1918 losses through tank fires were reduced to $1,287.50 in 1918, since which time up to September, 1924, there have been no losses from tank fires, in spite of the fact that there are now 125 creosoted tanks on the road.

Mr. Knowles did not credit the construction of creosoted tanks with the reduction in fire loss, but felt that the least that may be said for the creosoted tank is that it has not contributed to the fire losses.

Report on the Inspection of Painting

THE inspection of painting may well be considered under two heads, (1) the inspection of work whlie in progress as a means of assuring that the painting is properly done, and (2) the periodic or service inspection of the painted structure as a means of ascertaining its state of preservation. Both have for their ultimate object the protection of the structure from the weather through the agency of a paint coat, the first by insuring that a good coat is obtained and the second to see whether the coating is still serving its purpose effectively or is in need of renewal. The service inspection has the further object of providing data whereby the service rendered by a paint or paints may be carefully studied.

Inspection of Workmanship

Measures to insure good workmanship of railroad bridge and building painting must be considered from the standpoint of both contract and "company" work, since it is only in the case of the former that it is ordinarily deemed necessary to employ an inspector for the purpose of maintaining a detailed check on the work while it is in progress. In the case of painting done by company forces, the check on the work is effected through the machinery of the maintenance of way organization in the form of the supervision exercised by the general painter foreman, master carpenter, division engineer, etc. The basis for this plan is not so much that it affords much actual inspection but that the organization, through its established plan of administration, will insure the employment of a staff of painter foremen capable of doing good work and who have the interests of the company sufficiently at heart to work as well as they know how. The railroad is particularly at the mercy of the painter foreman because it is not often that any of his superior officers has had any actual experience at his trade, as a consequence few of them are able to exercise more than a general supervision over his work.

When any work is let by contract it is a part of prudent business to have it inspected while in progress to insure that it is being done properly. Painting is no exception to this rule. The qualifications of a painting inspector are much the same as for an inspector of any other class of workmanship. He must possess industry, moral courage, persistence, a sense of responsibility, sufficient education and intelligence to understand the provision of the specifications and, if possible, a practical knowledge of painting. Some would place the last requirement foremost, and at first thought that would seem most logical, but in the practical administration of the work the requirement that a paint inspector must have been a painter is not always fulfilled. For example, in the building of new bridges, the field painting follows the erection and under the usual plan the engineers and inspectors who look after the erection are also required to supervise the painting. The same rule usually applies in building construction. Since, in general, indifference or carelessness in building painting is usually discernible after the work has been completed, whereas in bridge painting many of the defects are concealed, detailed inspection during the course of the work is most necessary for the latter.

Duties of the Painting Inspector

(With Particular Reference to Bridges)

Thoroughly effective inspection of contract bridge painting implies the presence of the inspector on the work thoroughout its duration. Under certain circumstances it may not be necessary for him to be present while the painting is in progress, but it is imperative that he sees all portions of the surface before the paint is applied to insure that it has been properly cleaned. Owing to the fact that on most jobs the work of cleaning and painting must be carried along together this means that the inspector must be present on the work at all times. This rule is particularly important in the case of bridges exposed to locomotive gases or those carrying highway traffic on solid floors that permit of more or less leakage. On such structures good results will be obtained only if the cleaning and painting are carried out in small areas at a time, the painting following the cleaning just as quickly as practicable in order that the surface may not have an opportunity to become recoated with soot or slime before the paint can be applied. Moreover, the combination of the drip with the locomotive gases causes an unusual amount of corrosion and therefore requires a good deal of slow and arduous labor to remove the scale entirely. In addition to this the passage of locomotives blowing smoke and gas makes the working conditions unusually unpleasant so that there is a natural tendency to complete the work as quickly as possible, slighting it where this can be done without detection. At best, the conditions encountered are exceedingly unfavorable, and even with the most persistent activity of the inspector it is exceedingly difficult to obtain satisfactory results.

On large truss spans or high steel viaducts a large portion of the work must be done from scaffolds, thereby requiring that the painting shall immediately follow the cleaning to avoid a second setting of the staging. Under such conditions it is desirable, in fairness to the contractor, that the inspector be at hand to inspect the surface as soon as the cleaning has been completed and the paint coat as soon as it has been applied to save the contractor the necessity of resetting the scaffold in order to correct defects.

In addition to his responsibility for the condition of

Typical Convention Groups

the surface before applying paint and the thorough and complete application of the paint coats, the inspector should see that the paint is thoroughly mixed and of a proper consistency. He is also the judge of the propriety of continuing the work under unfavorable weather conditions and should stop operations during wet weather. Paint has been applied to many structures under unfavorable weather conditions when it would have been better to let the painter remain idle under pay. The cost of the paint being applied would at least have been saved.

The painting inspector can also render a valuable service to the railroad in the form of the records made during the course of the work. His report should include a detailed statement of the condition of the old paint before the new coating was applied, the extent to which the old paint had to be removed before the new one could be put on, the weather conditions throughout the period that the work was in progress and the kind and quantity of paint applied.

Thorough inspection and effective work by the inspector demands that the new coats of paint applied be of a sufficiently different shade from the old one and that in cases where spot painting is done before the full coat is applied or where two full coats are called for, that each coat of paint be of a sufficiently distinctive shade so that the inspector will have no difficulty in determining whether it has thoroughly covered the preceding one. If the new coat is exactly the same shade as the old one, it is almost impossible for the inspector to see if the new coating covers the entire surface, especially in dark places as on the inside of truss members or the under side of floor systems.

The employment of the inspector implies that he will be clothed with sufficient authority to stop work when it is being improperly done or when weather conditions make it undesirable for the work to continue and to require that work improperly done be done over.

Service Inspection

On by far the great majority of the railroads the service inspection of painting is conducted purely as an incident to the general inspection of the fixed property by the maintenance of way and structures organization, which includes frequent periodic inspections by the bridge and building supervisor, supplemented by seasonal or annual inspections by division officers and, as a rule, by annual inspections by system officers. Under this plan the paint on bridges and buildings is among the items which receive consideration in judging the physical condition of the various structures. And as these inspections are the basis for the annual budget of maintenance appropriations, it serves also as the means of determining the items on the annual painting program.

Some roads carry this plan a step farther, with respect to steel bridges, by the employment of bridge inspectors, who make much more detailed examinations of the bridges than can be carried out by the division inspection parties, which cover many miles of line in a day's time. Railroads that maintain this inspection service justify it by the more complete records of the physical condition of their bridges which it affords not only as to the metal but also as to the condition of the paint at any given date and the service obtained from the paint applied.

The committee is of the opinion that the railways may well give consideration to a further extension of this idea through the employment of district or system inspectors of building painting, if not also of bridge painting. It is believed that this would be fruitful of many improvements and economies in the use of paint on railway structures. A closer check on the service obtained from paints would provide information of great value in the selection of the most suitable materials. A more critical study of the methods followed by the paint gangs would lead to the development of standardized practices in painting. The systematic inspection of the structures by an officer whose first concern is the paint would lead to great economy in painting through the application of corrective measures such as spot painting or partial coatings on the portions of structures subject to the most rapid deterioration of the paint.

The report was signed by Martin Kane, (D. & H.), chairman; W. S. Lacher *(Ry Engr. & Maint.)*, vice-chairman; G. M. Hoffman, (P. & R.); J. S. Airmet, (O. S. L.); Charles Ettinger, (I. C.); J. R. Shean, (Los Angeles) and R. E. Wait, (Wab.).

Discussion

A. Montzheimer (E. J. & E) advocated more frequent painting, expressing the opinion that viaducts subjected to severe smoke action should be painted as frequently as every two years. G. W. Rear (S. P.) described a number of processes which he had used to clean rust from steel. One of these consisted of the swabbing of the surface with benzine and then applying a torch, thus burning off the rust, after which the paint will adhere to the clean steel. He also applied whitwash to steel and allowed it to remain over night. The white-wash was then brushed off and the paint applied, the white-wash tending to neutralize the rust. Mr. Rear referred to two of the largest bridges on his road which were built in 1909 and 1910, neither of which has since required painting other than a little spot painting. He also referred to a bridge over salt water where all evidences of rust are removed by spot painting every three or four months at small expense, which practice has maintained this structure in good condition for 26 years.

C. W. Wright (L. I.) emphasized the necessity of employing competent inspectors where work is done by contractors. This led to an active discussion of the advisability of contracting work of this character. In replying

to a question regarding the advantage of contracting painting, E. L. Sinclair (C., M. & St. P.) stated that it had been his observation that railway painting forces required more staging than those of the contractor, thereby adding to the cost of the work. J. P. Wood (P. M.) took issue with this statement, stating that he had found that railway gangs, properly directed and supervised, could work as economically as those of the contractor. A poll taken indicated a sentiment overwhelmingly in favor of handling bridge painting by company forces.

Report on Smoke Jacks for Roundhouses

THE committee's investigation of the use of smoke jacks for roundhouses has extended back to about 1880. At that time the jack in most general use consisted of a sheet-iron pipe or flue, 20 to 24 in. in diameter, with a bell-shaped section or hood at the lower end which could be raised to permit a locomotive to pass under the jack and then lowered over the stack. The locomotive had to be spotted accurately. Occasionally a jack was damaged through failure to raise the hood. These jacks, made of 12 or 14-gage iron, had the advantage of lightness and, as a very good grade of sheet iron was made in those days and the demands on the jack were less severe than at present, they were quite durable. They were provided with a cap, in some cases with a ventilator head, and with a flange sheet which fitted the slope of the roof, and were held in place by rods fastened to the roof timbers.

As sheet metal began to replace sheet iron, and as locomotives increased in size, the life of the jack was shortened and other materials were used, first above the roof line, among which were galvanized sheet iron, terra cotta pipe, and, later, cast iron. As more engine repairs were made in the roundhouse, rather than in the back shop, necessity arose for moving the engines along the pits and jacks with elongated hoods developed. These at first were of ordinary wood construction fastened together with steel wire nails. The nails soon corroded, and the joints opened up, making spaces in which sparks might lodge, so that the jacks were short lived. To overcome this trouble, nails of zinc or non-corroding alloy were used and the jack was lined with thin asbestos board. Finally the wood was left out entirely and the entire jack was built of asbestos lumber, or transite board, as some call it. About 1906 the first hooded cast-iron jack was made. Following the development of reinforced concrete, a few jacks have been made of that material. At the present time there are jacks of wood, transite board, cast iron, and concrete.

The increase in the size of locomotives has made necessary an increase in the size of the jack, including both hood and flue. As stated previously, jack flues were 18 or 24 in. in diameter 40 years ago, while those installed today are from 36 to 48 in. in diameter.

Size of Flue Determined Arbitrarily

The size of the flue opening seems to have been based largely on experience. A certain size of flue has been retained as standard until smoke conditions resulting from the use of larger engines have made the adoption of a larger jack opening imperative. Undoubtedly this situation has had considerable to do with the life of some jacks. One large road reports the use of 30-in. flues as satisfactory prior to the acquisition of Mikado locomotives, but that these engines forced the adoption of 36-in. flues, and, with the advent of still larger engines, 40-in. flues are being used. The locomotive grate area in each case, compared with the jack flue area, is as follows:

Type of Locomotive	Grate Area	Flue Area	Ratio
Consolidation	50 sq. ft.	4.21 sq. ft.	0.084
Mikado	70 sq. ft.	7.07 sq. ft.	0.101
Santa Fe	88 sq. ft.	8.73 sq. ft.	0.099

This would indicate that, in a well designed house, the area of the jack flue should be about 10 per cent of the grate area of the largest locomotives which are to be accommodated.

Caps over the flues have, until recently, been thought necessary in cold climates, but in the south these are not always provided. When metal straps support the caps they are frequently the first part of the jack to fail. With the larger jack flues there is a considerable loss of heat from the house, although the low hung hood prevents this from being as large as would result from a clear roof opening. Some jacks have been equipped with dampers to overcome this heat loss. A rod leading from the jack to an adjacent post and down the post to within reach from the floor controls the damper. It would seem as though such a device should accomplish the result desired, but some of the roads that have tried the dampers report that little attention is paid to them by shop employees and they are not now installing them. It has been claimed that, even when open, they obstruct the free escape of the smoke. In such cases the tendency is to leave them open all the time. A variation of the damper idea is a removable cap, also operated by a rod leading down an adjacent post. This requires the same attention as a damper.

Unless monitors or other parts of the roof make it necessary to extend the flues to a greater height, a projection of 3 ft. above the roof line is usually sufficient. It is this part of the jack which undergoes the most severe service because of its exposure to the weather and continual expansion changes. In some jacks the flue is larger in diameter than the upper part of the hood, leaving an annular space between the flue and the hood connecting directly with the interior of the house. The purpose of this is to create a draft from the house into the flue which assists in drawing the smoke out of the hood. Flues must be equipped with a flashing angle or collar at the roof line.

The length of hood in the direction of the track is usually not less than 8 ft., but a 10-ft. length is more common and there are numerous installations of still longer hoods. Occasionally, a double hood is used, giving a total length of 20 ft. The width of the hood is ordinarily about 3 ft. 6 in., the lower side section being given a little extra flare and being equipped with a drip trough. The slope of the ends should not be too flat or the smoke will hang in the hood. An angle of 65 deg. with the horizontal is about right.

The hoods of some of the larger cast iron jacks have been made with wooden sides fireproofed. This materially lessens the weight.

Wood, Asbestos, Cast Iron and Concrete Jacks

The wooden jacks now on the market are quite different from the old home-made jack, being built up of laminated planks consisting of strips of redwood or fir 2 in. square. Unless the material from which they are made is well seasoned, they are subject to some of the troubles which affected the old wooden jacks and there may be some question as to the continued effectivness of the fireproofing. The weight of a wood jack with a 12-ft. hood and an 8-ft. flue 40 in. square is 1,520 lb.

Transite jacks are of about the same weight as wood

jacks, but entirely fireproof. They are made up of sheets of transite board, which is composed of asbestos fibre and Portland cement, mixed together and pressed into sheets. The parts of the jack are held together with bolts. The heads and nuts of the bolts, after placing, are covered with asbestos cement, and open joints are filled with this material. This work must be well done to be effective. While transite board is not as strong as other materials, this is not important if the jack is not subject to blows. In recent years transite jacks have been made with curved sheets forming part of both hood and flue. It has been difficult to maintain the density of the transite in these curved sheets and the manufacturers have now returned to the use of flat sheets. This also simplifies the erection, and the jack can be shipped knocked down in compact shape. Thicker material is used for the flues than for the hood and this should increase the life of the jack. The life of transite jacks varies from 5 to about 12 years. A jack of this material with a 10-ft. hood and an 8-ft. flue 42 in. square weighs about 1,500 lb.

The hood of the cast iron jack is likewise made of thin plates. The flue, however, is made of cylindrical sections. All parts are held together by bolts. The heads and nuts of the bolts are inset in cast iron covers. The jack is fireproof and its life is generally about 15 years. The weight of a jack with a 12-ft. hood and a 7-ft. stack 40 in. in diameter is 5,400 lb.

The relative cost at the factory of the three jacks for which dimensions are given above, transite, wood, and cast iron, is about as 7, 10 and 13. The transite jack, it should be noted, has a smaller hood.

Concrete jacks have been built in place as a part of concrete roundhouses and have also been built as pre-cast units and installed in houses of other construction. Some of the earlier built-in-place jacks went to pieces, possibly as a result of poor concrete. The unit jack is built in three pieces, hood, flue and cap, the walls being 2 in. or less in thickness and plastered onto a form rather than poured. The committee does not know of any house entirely equipped with unit concrete jacks, but has learned of several experimental installations. The concrete in these jacks has stood up very well.

In conclusion, the committee quoted the specifications of the American Railway Engineering Association for smoke jacks and their construction.

Smoke Jacks for Other Buildings

The jacks herein described are for use with stoves or small heaters on buildings where brick chimneys are not provided. They have an advantage over chimneys in that they can be placed at any point on the roof and thus allow the stove to be properly located in the building without the use of an excessive amount of stove pipe.

The simplest jack is a pipe of galvanized sheet iron the same diameter as the stove pipe with a flange plate riveted to the pipe and nailed to the roof sheeting under the roof covering. The plate must be of such size that the heat transmitted through it will not fire the roof.

An improved type has a second and larger pipe surrounding the smoke pipe. The larger pipe is in direct contact with the roof. There is an annular air space between the outer and inner pipe. These jacks are made in various forms. For temporary or isolated buildings they are fairly satisfactory but must be watched.

For permanent building, or temporary buildings around a terminal, the cast iron jack is safer and it has a much longer life. In principle it is similar to the type last described, employing the air space to safeguard the roof. They can be obtained with adjustable roof sections to fit various roof slopes. Some attention must be given bolts and rods on the adjustable type as the jack may fall as a result of their failure. These as well as all other jacks should be provided with a cap.

The report was signed by: Maro Johnson (I. C.), chairman; J. K. Bonner (N. Y. C.), vice-chairman; V. E. Engman (C., M. & St. P.), T. D. Kemp (Sou.), A. B. McVay (L. & N.), E. R. Wenner (L. V.).

Discussion

The discussion centered largely around the relative merits of different types of smoke jacks. R. G. Kenly (M. & St. L.) stated that he uses asbestos cement plaster on boards with good results. A. Montzheimer (E. J. & E.) saw no objection to wooden jacks on concrete roofs. He has found transite asbestos jacks brittle and easily broken. F. C. Baluss (D. M. & N.) advocated the use of telescoping jacks where engines are housed over night, thereby keeping the house free from smoke.

Union Pacific Completes Bridge Over Columbia River

By G. H. Trout
Bridge Engineer, Union Pacific System, Omaha, Neb.

THE Union Pacific has recently completed the replacing of its bridge over the Columbia river on the Yakima branch near Kennewick, Washington, where the river is about 2,600 ft. wide and during the greater part of the year has a depth in midchannel of approximately 30 ft. with a current velocity of about four miles per hour. During the high water period, which usually extends from March to the middle of July, the river rises about 30 ft. and materially increases in velocity.

The old structure, which consisted of nine 150 ft. through Howe truss spans; one 240 ft. through Howe truss swing span all on concrete piers, together with pile trestle approaches on each end, was replaced with three 192-ft. Pratt trusses, three 242-ft. Pratt trusses, three 90-ft. through plate girders, a 280-ft. center bearing through swing span, a 304-ft. trestle approach on the east end and a 418-ft. trestle approach on the west end.

Before attempting to make any studies as to the types of superstructure the old piers were investigated. Ten of the piers were drilled to a point some distance below the bottom of the concrete. These tests verified the first assumption that in designing a new steel superstructure these piers could not be used as a permanent support. In several of them the hard concrete was found to be from two to four feet above the bed of the river, resting on gravel which was confined by the timber caisson, this protected by riprap. The possibility of repairing them was carefully studied, but it was finally decided to build an entirely new bridge. As the location of the structure was such that trains could easily be detoured during construction it was decided to retain the existing grade and alinement and the new structure was designed to fit these conditions.

Preliminary Studies Made with Diamond Drills

Before ordering material and starting the foundation work it was deemed advisable to make tests of the foundation at each proposed new pier site, in order to determine whether the rock was of sufficient thickness to serve as a foundation and whether or not the bed of the river contained any large fissures or crevices that were liable

to present unusual difficulties. The tests of the rock were made by means of a diamond drill and the plant was mounted on a flat car, which facilitated the movement from pier to pier as the borings were completed.

The procedure of drilling where the rock was overlaid with a layer of gravel was to connect up lengths of heavy three-inch casing, fitted with a heavy shoe somewhat heavier than an ordinary coupling. The casing was lowered to the bed of the river and forced through the sand and gravel by means of a small drop hammer weighing about 100 lb., operated by a small drum on the drill machine. The hammer enveloped a one-inch pipe which extended from about five feet above through to the bottom of the casing. The upper end of this one-inch pipe was connected to water hose and the lower end served as a chopping bit, the water being forced through it for the purpose of carrying the loose sand and gravel to the top of the casing as the bit loosened it up. The drop of the hammer was about 18 in. and as the casing was being driven it was given about a quarter turn to the right between blows in order to keep it from sticking. At times it was necessary to churn with the wash pipe only, followed by the driving of the casing. In the gravel formation boulders were frequently encountered. Where this occurred a stick of 60 per cent dynamite was attached to a wooden stick about 18 in. to 24 in. long which was fastened to the lower end of the wash pipe and lowered against the obstruction. The casing then raised about 18 in. to prevent damage to it and the shot fired by means of a wire and exploder. The casing was then driven back and the work resumed until solid rock was reached, when the diamond drill was introduced in place of the chopping pipe.

Removing the Old Truss and Piers

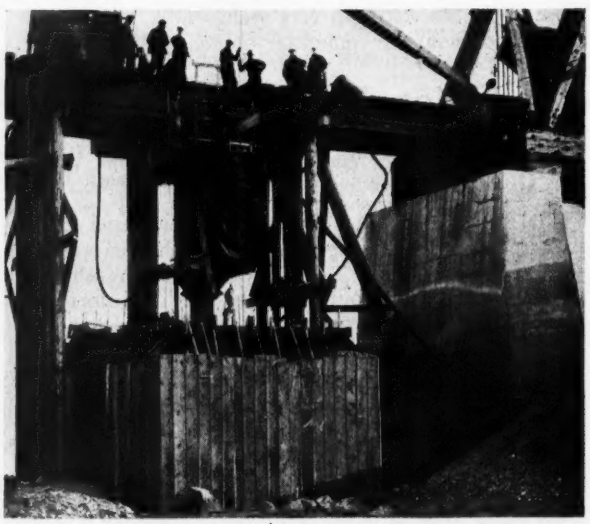
For the piers in the middle of the stream where there was no gravel or overlaying soft strata, considerable difficulty was experienced in holding the casing plumb in order to permit free turning of the drill shaft. Because of the depth of the water and the current this was taken care of by numerous guy wires, and where possible setting the end of the casing against a ledge of rock in order to hold it in place. As soon as the casing reached the rock a 2½-in. hole was drilled in about 12 in. deep and a 2-in. casing slipped down through the larger one into the hole; this served as an anchor to hold the casing in place and then the regular ⅞-in. core boring was started. The tests were carried down to a depth of about 20 ft. below the bed of the river and the cores of each test brought up, removed and assembled showing the actual condition of the foundation.

The progress of drilling in the lava rock was about five feet per hour, but as the core lifter used on this job was only five feet long it was necessary to raise the entire string of rods carrying the bits in order to remove the core, then put back the rods to resume drilling so that the average progress was about 3½ ft. per hour. The rate of sinking the casing through gravel was about two feet and in boulders about six inches per hour. Two men were required with the drilling machine and two for helping pull casing, hauling coal, etc. The loss in weight of the diamonds from abrasion in drilling through about 200 feet of lava rock amounted to $40.

The foundation caissons were about 20 ft. wide by 45 ft. long by 21 ft. deep, made up of 12-in. by 14-in. timbers sheathed with 2-in. by 12-in. S4S, and provided with a steel cutting edge and a 7-ft. working chamber. Each caisson was equipped with a man shaft and lock three feet in diam. and a material shaft and lock two feet in diam., and was surmounted with a removable watertight crib about 18 ft. high, made of 12-in. by 14-in. timbers. This was removed after the caisson was in place and the concrete work completed. The caissons were built on ways of steel rails laid in a pontoon which was moored along side of the trestle approach. As each caisson was completed the pontoon was towed to deep water where it was filled. One side then being removed, the pontoon was tipped and the caisson launched. The caisson was towed to the proper location and sunk to the solid rock, the cutting edge extending in about two feet. The maximum depth of water was not over 40 ft., consequently the air pressure was comparatively light. After the caissons wers sunk and at the proper elevation, they were sealed off at the cutting edge and the concrete was then deposited in the working chamber. As there was but little sand the material could not be blown but had to be handled through the material shaft by means of a bucket hoist.

Use of Old Spans Dispensed with False Work

The erection of the new steel and the removal of the old superstructure and piers was handled by company forces. As the character of the bottom of the river and the current did not permit false work the old spans were used for carrying the new steel during erection and as the distances center to center of the trusses of the old and new structures were about the same it was expedient to erect one truss inside and the other outside of the old spans. The outside truss was carried on out-riggers located at the panel points of the new steel spans and con-



Sinking One of the Caissons

A View of the Completed Structure

sisted of 14-in. by 28-in. stringers previously removed from the old trestle approaches. Before starting to erect the new steel, the old trusses were lowered about two feet and the top lateral systems were removed. In their place a sufficient number of 8-in. by 16-in. stringers were laid across the top of the old trusses and bolted at such points as would not interfere with erection. In order to maintain the required camber of the new truss, tapered steel wedges 8 in. wide were set under each panel point and the steel raised when necessary.

The girders were set and the trusses erected by means of a derrick car. The material was loaded by a locomotive crane and moved to the derrick on flat cars handled by a "dinkey." Upon the completion of the erection of the trusses of the three spans west of the draw span a derrick car started at the west end backing up and removing the old floor, being followed by a locomotive crane putting in the new floor system. As the floor was changed the 14 in. by 28-in. outriggers which had been used for supporting the outside steel truss were removed and placed below the bottom chords of the old Howe truss and lashed to the new steel at the new steel panel points for the purpose of supporting the old trusses as they were dismantled. After the erection of the spans west of the draw span those on the other side were erected in like manner. The old Howe truss which was inside of the new steel work was taken down piece by piece, but the outside ones for two spans were dumped in the river and towed ashore to be dismantled.

It was necessary to maintain a 60-ft. channel open for boats at all times in order to comply with government requirements. Since the old and new swing spans were of different lengths and their respective pivot piers about 60 ft. center to center, some difficulty was presented in erection. The old draw was cut off at the new pivot pier, making a bobbed-tailed draw, and counter weights placed on the short arm to balance, in order to permit operation. The portion cut off was then lowered and the trusses spread apart, one end being carried on the end pier of the old draw and the other on bents set on the footing of the new pivot pier. In a similar manner that portion of one of the old Howe truss spans overlapping the end of the new draw span was lowered and spread. These portions of the old spans were used as false work for erecting the west arm of the new draw span. Following the erection of this arm of the new draw the remaining portions of the old draw were taken out by first removing the floor system and then dropping the trusses into the river, after which the east arm of the new draw was erected as a cantilever.

The permit for constructing the bridge required that the channel piers be removed to the bed of the river and the others to an elevation about 15 ft. below the surface of low water. This presented some difficulty as the new piers in some cases were only 20 ft. from the old ones. The removal of that portion of the pier shaft above the water was simple as a barge and float were set alongside and the piers drilled and sufficient shots put in to break them up, the material falling over on the barge and floats.

In removing the old piers below water it was decided to drill the full depth of the section to be removed. For this work a No. 50 clipper drill was used. The drill was suspended by a light tackle from the bridge as in some cases the drilling reached a depth of 28 ft. This worked out very nicely for the piers that had to be removed to an elevation only about 15 ft. below low water level, but for those in the channel of the river where it was desired to drill the full depth in order to remove them entirely the quality of the concrete was such that it was very difficult to drill more than 18 or 20 ft.

Removal of Old Piers

The pivot pier was about 32 ft. in diameter at the bottom and after removal to the water surface 44 holes were drilled in it, the idea being to get all holes the entire depth of the pier a distance of about 28 ft. and then load all and fire at one time. But owing to the difficulty of drilling more than 20 ft. it was decided to "shoot" at that level and the holes were loaded with 1½ lb. 60 per cent gelatin per cubic yard of concrete. This would ordinarily be considered an excessive charge but was done to insure a complete fragmentation of the concrete. This shot broke up the concrete fairly well and the loose material was dredged out, after which there remained about 8 ft. The top of this was smoothed off and preparations made to drill the remaining portion of the pier. This was done by putting down 2½-in. casings against the concrete in order to hold the drills and about 20 holes drilled through this portion of the pier. These were loaded and in addition a number of "doby" shots of from 25 to 30 lb. were located at various places, taking into consideration the location of the drill holes. On account of the depth of the charges below the surface of the water 1,000 lb. of 60 per cent gelatin was used for this shot. Very satisfactory results were obtained as the dredging afterward proved.

The old draw rests consisted of four hexagon cribs, each side of which was about 20 ft. long and made of 10 in. by 10 in. timber filled with one man stone. These were removed to the water surface and the rock loaded on floats and barges, after which a diver placed cartridges, each made up of 25 lb. of 60 per cent gelatin, around the bottom of the cribs at intervals of about five feet. Cartridges were also placed at various places between the timbers at intervals of 3, 8 and 15 ft. above the bottom and all charges then fired simultaneously. This explosion cleared out most of the timber and loosened up the rock so that material could be dredged to the bottom of the river. Some difficulty was anticipated in dredging in deep water on account of the current; however, it worked very satisfactorily. The amount of material removed was 13,000 cu. yd., about 60 per cent of

which was wet work, and the cost was $2.81 per cu. yd.

While the work of removing the old piers required the use of considerable quantities of explosives and often in quite heavy charges there was no damage to the bridge or piers and the removal was accomplished to the entire satisfaction of the U. S. Engineers in charge of the district.

The erection of the superstructure and removal of old piers was done by company forces and the entire work under the supervision of the engineering department.

The Story of the Eads Bridge Over the Mississippi

By C. E. Smith
Consulting Engineer, St. Louis, Mo.

THE problem of bridging the Mississippi river at St. Louis was more difficult than any other bridge problem undertaken up to that time. In floods and ice gorges the flow carries away the entire bed 100 ft. deep to bed rock, which is worn smooth from the erosion of the sand flowing with the current. At St. Louis the rise and fall is 45 feet. Ice sometimes packs and gorges to a depth of 20 ft.

The main river bridge consists of two arch spans 502 ft. in the clear, and one central arch span 520 ft. in the clear, carried by two river piers and two shore abutments with masonry arch approaches for 225 ft. on each end.

Each span is formed by eight arch tubes, in four pairs of two, one above the other. The two tubes forming each vertical arch rib are 12 ft. apart and have pin joints 12 ft. apart with a diagonal system of braced eye bars between them. The four ribs in each span are cross braced. The two outer ribs are 16 ft. 6 in. center to center on each side and each pair carries one track. The two inner ribs are on 12 ft. centers. The railroad floor and the highway floor are carried by four lines of riveted vertical posts resting by forked plates on the pins in the four upper arch tubes.

The East St. Louis approach is a steel trestle with 4 per cent grade for the highway and 1.5 per cent grade for the railroad. It consists of masonry walls and fill for the railroad tracks west about 1,000 ft. to Third street, with bridges over First and Second streets and highway floor supported by the side walls of masonry. The entire bridge structure is about one mile in length. At Third street, St. Louis, the highway floor meets the street level; the railroad tracks extend in a tunnel west to Eighth street, turn 90 deg. and continue south in Eighth street a total distance of about one mile.

The Bridge Cost Over Seven Million

The bridge cost about $7,000,000 for construction, not including overhead and carrying charges during construction. The tunnel cost $1,250,000.

The site of the west abutment had for over 60 years been a steamboat wharf and was full of old iron, grate bars, fire brick, smokestacks, all parts of steamers. In the fire of 1849, when 29 steamers were destroyed, the burnt hulks of two were sunk here, one above the other. Later another steamer was sunk here. The bottom planks and sides were oak, 3 and 4 in. thick.

Two—and partway three—sheet pile dams were driven, outing through the wrecks and rubbish by chisels. They struck a paddle wheel, cranks, engines, sawlogs, anchors, all of which broke the cofferdam, and caused it to leak, making it difficult to unwater the bottom in 30 ft. of water. They apparently did not feel safe to seal the bottom with concrete, as we do now, but laid the masonry on the bed rock.

Eads had originally proposed to sink his piers by open dredging inside cast iron cofferdams and sinking his masonry piers within them by floating down. But his European trips gave him the opportunity to see and learn of pneumatic foundations. In March, 1869, he had conferences with several noted French and British engineering officers.

As the proposed spans were 200 ft. longer than any yet built in Europe, these engineers frowned on him, but convinced him that he should use compressed air. He returned in April, 1869, to change his plans. By June 1, he again had 1,000 men at work, which was increased to 1,500 by September 1. He had 24 boats, 37 engines, 31 pumps, 29 derricks, 40 travelers, 24 hydraulic hoists; everything in duplicate.

First Use of Pneumatic Caissons

James Andrews, Pittsburgh, was given the contract for all the masonry. The U. S. Gunboat Milwaukee was cut up for plates for the caissons. The caisson for the

A View of the Bridge as It Appears Today

east pier was launched from the marine ways at South St. Louis in October, 1869, and towed eight miles to the bridge. The river bed was reached in November, and bedrock on February 28, 1870, 95 ft. below the water surface. Filling the caisson was continued until April 13, when the cofferdam was overtopped, the water being 110 ft. 6 in. above the rock, and the air pressure 50 lb., a record for depth and pressure, held by this bridge until recently. On May 27, 1870, the air chamber was filled. During the sinking of this pier it was cut off from land for 15 days by ice, but work went right on, the men living at the pier.

The west pier was started on January 2, 1870, reached river bed on February 2 and bed rock April 1, and was filled May 8. This pier went down only 86 ft. below the surface of the water. During the summer of 1870 the masonry of the two river piers was built up several feet above high water.

The original plan did not contemplate sinking the east abutment to bed rock, but on piles 50 ft. below low water, surrounded by riprap. Later it was decided to go all the way, 136 ft. below high water, at an increased cost of $175,000. The caisson was launched November 3, 1870.

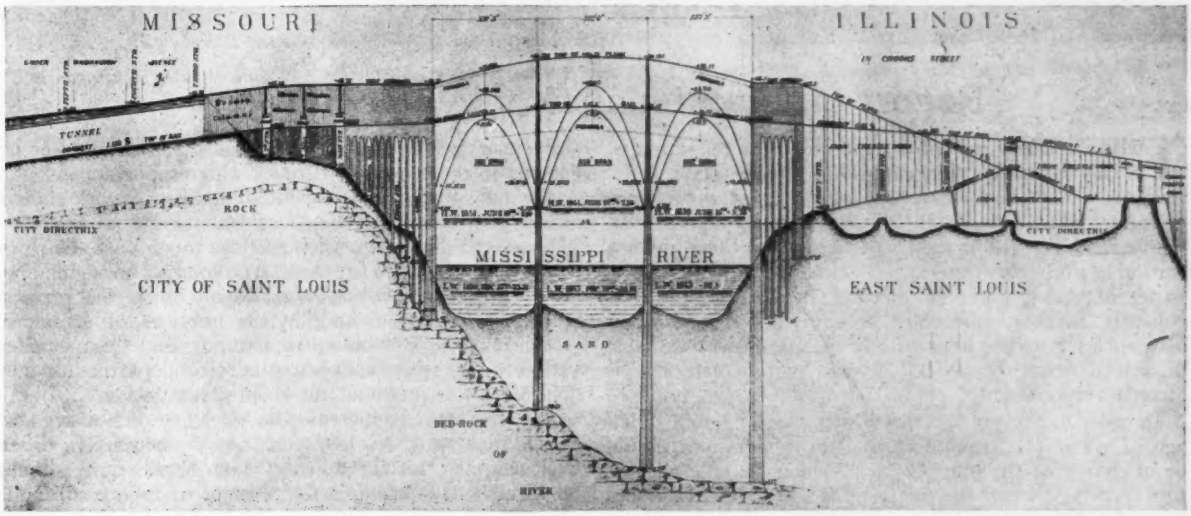
and reached bed rock at 109 ft. 8 in. on March 28, 1871. For many years this was the deepest pneumatic foundation. On April 30 the caisson and chambers were filled.

On March 8, 1871, a tornado damaged this pier to the extent of $50,000. All derricks, travelers and machinery were blown down. One man was killed and eight injured. The air supply was stopped, the men brought out and the caisson filled with water. Freight and passenger cars and locomotives were blown away.

The piers are large enough to support any arch without mained at the original prices. By reason of these changes and the Keystone Bridge Company's growing fear of the erection, Andrew Carnegie caused the bridge company to get a report in 1872 from James Laurie, consulting engineer, but nothing much came of it.

Erection of Superstructure

The arches were erected without any falsework in the river by balancing the progress and cantilevering out from timber towers on the piers and anchoring back on



The Profile of the Bridge Showing the Depth of Piers

the others. The dimensions and cost of substructure are as follows:

	Length	Width	Height	Below Low Water	
East Abutment	83 ft.	70 ft.	192 ft. 9 in.	93 ft. 3 in.	$664,000
East Pier	82 ft.	60 ft.	197 ft. 1 in.	86 ft. 2 in.	613,000
West Pier	82 ft.	48 ft.	172 ft. 1 in.	61 ft. 2 in.	464,000
West Abutment	94 ft.	62 ft.	112 ft. 8 in.	13 ft. 3 in.	339,000
West Approach Stone					433,000
East Approach Stone					267,000
Total—102,900 cu. yd.					$2,780,000

Great care was taken to avoid trouble due to compressed air, notwithstanding which much trouble was experienced. Of 600 men who worked under air, 100 were affected slightly, 119 others needed medical attention, 30 cases were serious and there were 14 deaths; 2 were paralyzed for life.

The east pier, the deepest, had only one death and 28 cases needing medical attention. This was due to precautions as a result of experience at the others. An elevator was installed, all men were examined daily, beds and hospital were kept at the pier, men had lunch at the work, were furnished beef tea, kept resting one hour after work; at the deepest men worked only 45 min.

Contractors Make Trouble

The contract for furnishing and erecting the steel was awarded to the Keystone Bridge Company, of which Andrew Carnegie was vice-president. The iron and steel contracts were awarded to one of Carnegie's foundries and several others. The contract called for a grade of metal quite unusual in those days and for careful inspection and full size testing in many parts. This was taken lightly by the contractors, but Eads held them rigidly to the specifications. As the contract prices did not cover such costs they sat back, did little or nothing and, by delay, forced one adjustment after another.

By reason of the various changes in steel and iron requirements only 643 tons out of a total of 6,141 tons re-

the abutments. Elaborate arrangements were made with jacks in the towers to counteract temperature changes in the erection cables and arches. The two halves of the west span come within ½ in. of the length, but the opening was too short to permit the full tube to be put in. After waiting for five days for cooler weather (in September) and packing the arch in ice to cause it to shrink, adjustable screw sections of tubes that were on hand for this emergency were put in just in time to save a loan of $500,000 in London, contingent on closing the first span on September 19, 1873. These sections were then screwed out, a little at a time, the lower tube at night and the upper tube in the daytime until the right length was obtained when the diagonals and pins were put in. No additional trouble was experienced with the other arches. Another loan was to expire if the second span was not closed by December 18. It was closed on time.

The sensitiveness of these arches to temperature stresses is shown by the change of 1 in. for each 25 deg. in the opening before the last section was inserted. Under certain conditions the temperature stresses in the tubes may exceed the load stresses. There may even be tension in one or the other ring under certain conditions. Under these conditions it can be seen readily that any section of tube can be taken out. In fact quite a number have been taken out and replaced. Before the erection cables had been released an extremely cold snap caused one arch to shrink and break two tubes. They were replaced by seven men in 18 hr. and the cables taken down. The completion of the upper superstructure, floors and approaches proceeded rapidly without any special trouble.

Bridge Opened in 1874

On April 15, 1874, the upper roadway was finished and was scheduled to open on April 18. On July 2 a public test was made with 14; 50 ton locomotives on one track

and 7 on each track. One engineer lost his nerve at the last moment and reversed his engine. He was dragged out with his wheels turning backward. The deflections of the various arch ribs varied from 1 in. to 4 in. The bridge was formally opened on July 4, 1874. St. Louis staged a parade 15 miles in length in honor of the event.

The river piers and abutments, the masonry approaches and the masonry footings of the east approach stand today as built and have never required any unusual expense for maintenance. The main arch ribs and braced diagonal web system are the same as when built, except that about 20 tubes out of a total of about 1,000 have been replaced due to corrosion. The vertical supports of the two floors are the same as when built, but slightly reinforced. The rod cross bracing between the arch ribs has been taken out and replaced by riveted stiff bracing. The railroad floor beams and stringers have been replaced and are now having plates added to strengthen them to carry the heaviest modern locomotives. The highway floor beams are the same as when built, except for replacements due to corrosion and heavier loading. The timber joists and iron beams that carried the highway floor between the masonry walls on the west approach were replaced two years ago with a reinforced concrete top. The east approach, formerly of Phoenix columns, has been entirely replaced.

Report on Maintenance of Water Stations

THE DELAY and inconvenience in the operation of trains caused by the failure of a water station to deliver its usual adequate supply of water cannot always be measured in dollars, but the expense is always considerable, and everything that can be done to keep such a station in proper working order is essential. The maintenance of tanks, pumping machinery, pipe lines, water-columns, intakes, windmills, treating plants and other accessories involves a multitude of problems that must be solved promptly and effectively by the man who is directly responsible.

In order to prevent failures which would cause a shortage of water for locomotive use, the repair man should be in charge of the pumpers and helpers, handle all routine repairs, instruct the pumpers as to the operation and care of equipment and see that everything is done to keep all facilities in first class condition at all times. By following a regular schedule of routine repairs the water stations on any railroad can soon be placed in a condition to render continuous reliable service and reduce the cost of supplying water.

The Repair Gang

In addition to the district repair man, each heavy division should have a repair gang with camp cars. It is the usual practice for this gang to work under the direct charge of a foreman or a carefully selected repair man who receives a higher rate of pay than the ordinary repair man. Gangs of this kind usually consist of from two to six or more men, varying with the requirements of the work in hand. This gang usually handles the heavy water station repairs, such as the renewals of pumps and boilers, the repair of tanks and such construction jobs as are not practicable or desirable to do by contract. The division water works gang should make all repairs to water tanks, including carpenter work, iron work and painting, and should also handle the changing out of pumps and boilers and such other heavy repair work as the district repair man is not in a position to handle. By handling repairs in this manner, current repairs can usually be made without interruption to service and many of the objectionable "first aid" repairs will be avoided.

All maintenance should be based on a well balanced and carefully planned program. A definite program, closely followed, will in large measure eliminate the need of emergency repairs. While it may not be possible to anticipate or prevent all possible emergencies, a definite plan, having in view maintenance of a permanent nature, sets up a standard that cannot help but produce good results.

It is the opinion of the committee that the maintenance of water stations should be under the direct supervision of the division supervisor of water service and that all water service employees should report to him. The division supervisor should report to the division engineer or directly to the superintendent of water supply.

The question of material for maintenance work should always receive careful consideration and maintenance employees will do well to keep in close touch with the division storehouses. The successful conduct of a maintenance program depends very largely upon the prompt delivery of material and, in the interests of economy, stocks must be kept down to a minimum. Co-operation between the store and water service departments will help solve this problem and avoid many delays.

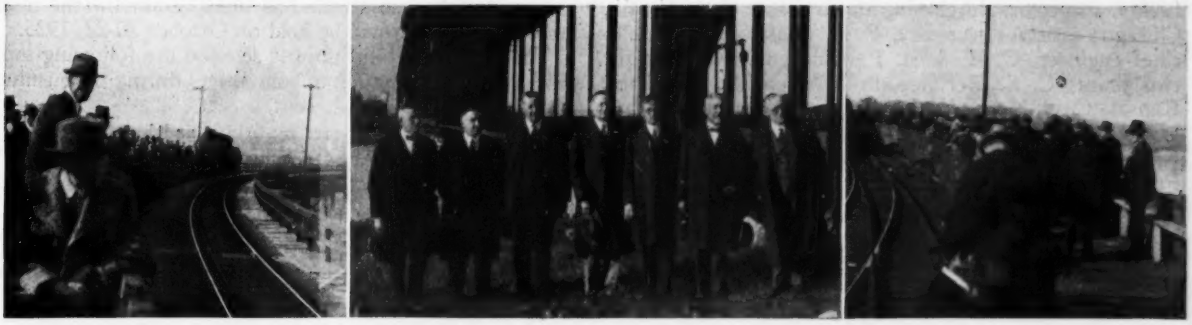
Nothing tends to increase the efficiency of a water station more than the proper making of repairs. In order to accomplish this the division water works gang should be furnished with a full complement of tools and appliances, a schedule of all repairs needed at any one station and the necessary material with which to make the repairs. The most economical repairs are those that are permanent. It is not always possible to carry a sufficiently large stock of repair parts without tying up too much money. For this reason occasions will arise when permanent repairs cannot be made. However, makeshift repairs are usually the result of poor supervision and constitute a reflection upon the supervisor.

A pumper or plant operator should be trained in efficient methods and have sufficient knowledge to be able to assist in remedying defects to plant equipment in his charge. At stations where supply lines, columns and tank valves are within a reasonable distance he should make periodical inspections and if defects are found should report them at once. In this way he may be able to prevent breakdowns with their accompanying evils.

Methods of Maintaining Various Facilities

Those responsible for the maintenance of water stations should devote as much time as possible to the inspection of the territory.

Dug wells ending in water-bearing strata require few repairs, an occasional cleaning out being all that is necessary. Pumps with intakes on the banks of streams or lakes require frequent clearing of mud and silt. The intake pipe should be of iron, with the end in the creek or river turned down stream and perforated sufficiently to admit water freely. A gate valve should be placed on the end of the intake pipe in the well or pump to shut off the water from the source of supply when the pump is being cleaned. Where the distance is not too great, a pipe should be run from the discharge pipe of the pump to the intake pipe back of the gate valve so that in the event of a clogged intake pipe it may be blown out and cleared by water from the pump or tank. The best wells are those that end in water-bearing rock. Those ending in sand and gravel and screened are serviceable but sooner or later the screen must be replaced.



Left to Right—Inspecting the Kansas City Terminal. Seven Past Presidents. Another View of the Inspection trip Which Was Made by Special Train

Water tanks should be of sufficient capacity to assure an adequate supply of water at all times. Where practicable they should be located away from tracks, and locomotives should be supplied by standpipes. Where water is delivered by spout direct from the tank, the spout should be suspended so that it will provide proper clearance for passing trains. Ladders should be of iron. Tank valves must be kept tight. In cold weather leakage will result in choking the outlet pipe with ice. Frozen outlet pipes may be quickly thawed out with steam from a locomotive, applied with a hose. On some railroads the outlet pipes are protected from freezing by encasing the pipe in a wooden box and filling the space between the pipe and the box with sawdust.

When the chimes of the staves and floors become partially decayed and it is desired to prolong the life of the tank, the bottom may be reinforced with concrete. The roof should then be supported on posts carried on concrete footings rather than by the staves. This, however, is seldom found expedient.

Electrically-driven pumps are more reliable and by far the most economical to operate and maintain where it is practicable to install them. Their economy in maintenance is especially noticeable. The use of electric motors dispenses with much mechanism.

Gas engine plants are costly to maintain. The machinery has many parts and, especially if operated by station agents or their helpers who usually have no particular liking for the job and give the machinery as little attention as possible, it is frequently out of order. The agent is inclined to defer pumping until the water in the tank is quite low, and then if he is unable to start the engine at once he sends a rush call for the repairman. An electric motor has few working parts, is seldom disabled and is easier to operate. Because of the ease of operation the attendant will attend to the pumping more promptly. There are cases where an electric pump can work automatically and this is the most desirable way.

It is not practical to install electric motors at all pumping stations. There is a hazard in that the supply of electric current may fail but the plant above referred to has never been so inconvenienced.

The report was signed by: O. C. Anderson (S. P.), chairman; F. M. Case (C. & N. W.), vice-chairman; J. M. Fitzgerald (C. of Ga.), C. R. Knowles (I. C.), Emil Oetzman (A. T. & S. F.), L. A. Cowsert (B. & O.).

Discussion

E. P. Hawkins (M. P.) objected to the recommendation in the report that repair gangs should be required to do carpenter work, painting, etc., on pump houses while engaged in repairs to the equipment, but Mr. Knowles said that in his opinion the gangs should do all the work that it is possible for them to do whenever they are at work in or around the plant. Water service men, he said, are specialists in water work.

W. T. Krausch (C. B. & Q.) called attention to the increased complexity of bridge and building work which now requires the employment of men skilled in some 27 different crafts. Many of these fall within the limits of what is water service work and requires that considerable study be given toward the perfection of the water service organization. He advocated the advancement of pumpers from employment at the more simple plants to those of larger capacity and complexity with the development of increased skill.

R. C. Bardwell (C. & O.) confirmed this thought, but pointed to the difficulty of securing competent men. It is easy enough, he said, to design a pumping plant, but it is not always so easy to operate it efficiently. He objected to the comparison of the gas engine-operated pumping with the electrical plant, since this involved a comparison with a type of plant that is rapidly going out of use, for gasoline engines are not nearly as economical as the modern oil or semi-Diesel engine. He also called attention to the disadvantage of the electric plant arising from the danger of interruption of the current supply.

Mr. Hawkins confirmed this statement by calling attention to the fact that on his line there are large areas in which electric current is not available. He moved the elimination of that portion of the report recommending that repair gangs do carpenter work, iron work and painting, but after discussion by G. W. Rear (S. P.), who favored having gangs do all work that they were capable of doing efficiently, the motion was lost.

Mr. Knowles called attention to the fact that considerable water service maintenance work is of a seasonable character. Water stations, he said, should be inspected before freezing weather and precaution taken against freezing of pipe lines, water columns and other facilities. Frost boxes, roofs of tanks and pump houses should be made as nearly frost proof as possible; stock yard lines and hydrants should be protected against frost or arranged so that they can be drained.

Closing Business

The following officers were elected to serve during the ensuing year: President, J. P. Wood, supervisor of bridges and buildings, P. M., Saginaw, Mich.; first vice-president, C. W. Wright, master carpenter, L. I., Jamaica, N. Y.; second vice-president, E. T. Howson, editor, *Railway Engineering and Maintenance*, Chicago; third vice-president, F. C. Baluss, bridge engineer, D. M. & N., Duluth, Minn.; fourth vice-president, Maro Johnson, assistant engineer, I. C., Chicago; secretary-treasurer, C. A.

Lichty, inspector, purchasing department, C. & N. W., Chicago; assistant secretary, F. E. Weise, chief clerk to chief engineer, C. M. & St. P., Chicago. Directors for two years: C. S. Heritage, bridge engineer, K. C. S., Kansas City, Mo.; W. B. Hotson, superintendent of bridges and buildings, E. J. & E., Joliet, Ill., and P. N. Nelson, supervisor of bridges and buildings, S. P., San Francisco, Cal. In addition, J. S. Huntoon, assistant bridge engineer, M. C., Detroit, Mich.; A. I. Gauthier, bridge and building supervisor, B. & M., Concord, N. H., and E. L. Sinclair, assistant engineer, C. M. & St. P., Marion, Iowa, hold over as directors for the ensuing year. Buffalo was selected as the location for the next convention, which will be held on October 20-22, 1925.

The Committee on Subjects selected the following topics for the consideration of committees during the ensuing year:

1. The use of motor cars by bridge and building gangs.
2. The relative merits of steel and wood sash for various types of railway buildings.
3. The use of creosoted timber, including the selection of woods best adapted to treatment.
4. Pre-cast concrete units for bridge construction.
5. The application of protective paints to structural steel.
6. The use of electricity for the operation of water stations.

Material Men Furnish Exhibit

A TOTAL of 48 firms which manufacture materials, tools, and equipment used in the construction and maintenance of bridges, buildings and water service facilities, were represented in an exhibit in rooms and corridors adjacent to the meeting room. This exhibit was conducted under the auspices of the Bridge and Building Supply Mens' Association.

Following is a list of the exhibitors, including the names of the firms, the materials and devices shown, and the names of the representatives. It includes, also, the members of the association which did not present exhibits:

American Tar Products Company, Chicago; S. H. Fields.

American Valve & Meter Co., Cincinnati, Ohio; model of drop spout and water column; J. T. McGarry and D. J. Higgins.

American Hoist & Derrick Company, St. Paul, Minn., literature; D. L. O'Brien.

Barber Asphalt Co., Philadelphia, Pa., literature and samples of roofing waterproofing, mastics, paint, etc.; W. P. Newhall and J. F. Dean.

Barrett Company, New York; roofing, shingles, creosote oil, preservative paint, specifications and literature; G. R. McVay and F. S. Nichols.

The Buda Co., Chicago, literature, motor cars, jacks and tool grinders; Geo. W. Hoover and A. L. Bliss.

Carter Bloxonend Flooring Co., Kansas City, Mo., built up wood block flooring; L. A. Guenther, J. G. Galvin.

Chicago Bridge & Iron Works, Chicago, photographs and literature; E. P. Shelton.

Cook, Inc., A. D., Lawrenceburg, Ind., deep well equipment; F. R. Giles.

Detroit Graphite Company, Detroit, Mich., samples of paint and literature; Tom R. Wyles, L. F. Flanagan and W. D. Waugh.

Detroit Steel Products Co., Detroit, Mich., photographs and samples of steel sash; R. S. Bishop and J. L. Bliss.

Duff Mfg. Co., Pittsburgh, Pa., jacks; G. E. Anderson.

Fairbanks-Morse Co., Chicago, literature; C. H. Wilson, F. M. Condit, B. S. Spaulding, E. C. Golladay, H. L. Hillerary, A. J. Olson.

Highgrade Mfg. Co., Cleveland, Ohio, literature and samples of roofing cement; S. A. Baber.

Home Lumber Co., New Orleans, La.; W. W. Bradley.

Johns-Manville, Inc., New York, samples of roofing, pipe and boiler insulations, packing, shingles, corrugated siding and roofing waterproofing and industrial flooring; P. C. Jacobs and W. H. Lawrence.

Joseph Dixon Crucible Co., Jersey City, N. J., literature.

The Kinnear Mfg. Co., Columbus, Ohio; H. F. Wehrle.

Kansas City Bridge Co., Kansas City, Mo., photographs; W. D. Glasscock.

Kansas City Structural Steel Co., Kansas City, Mo.

Lehon Co., The, Chicago, samples of roofing and shingles, waterproofing and roof coatings; Tom Lehon, John E. Eipper and J. W. Shoop.

Long & Sons, E. M., Cadiz, Ohio, model O. G. fir gutters; A. C. Long and J. C. Kinny.

Long-Bell Lumber Co., Kansas City, Mo.

Luitwieler Pumping Engine Co., Rochester, N. Y., model of pumping engine; O. G. Smith.

Massey Concrete Products Corporation, Chicago, literature; C. H. Hunsaker, D. A. Hultgren and Paul Kircher.

Missouri Valley Bridge & Iron Works, Leavenworth, Kas.

Murdock Manufacturing & Supply Company, Cincinnati, Ohio, hydrants, railway water service box and drinking fountains; J. C. Endebrock.

National Lead Company, New York, literature; Chas. L. Haas, A. H. Sabin, W. S. Carlisle, F. E. Dodge, F. M. Hartley, Jr., and W. Grant.

Nelson & Sons, Jos E., Chicago, literature; John Nelson and I. B. Tanner.

New Jersey Zinc Sales Co., New York, down spouts and gutters; D. P. Brannin.

Patterson & Co., W. W., Pittsburgh, Pa., tackle blocks; W. W. Patterson, Jr.

Patterson-Sargent Company, Cleveland, Ohio, literature; G. W. Anderson and H. H. Kohrs.

Paul Dickinson Co., Chicago, models of cast-iron camp car jack, ventilators and chimneys for small buildings; A. J. Filkins and C. W. Hansen.

Pittsburgh Plate Glass Co., Pittsburgh, Pa., plate glass, brushes and literature; B. E. Foster.

Portland Cement Association, Chicago, literature and balopticon; L. M. Arms and H. C. Boyden.

Railway Engineering and Maintenance, New York, copies of Railway Engineering and Maintenance, Railway Age and Maintenance of Way Cyclopedia; E. T. Howson, W. S. Lacher, F. C. Koch and J. M. Rutherford.

Railway Equipment and Publishing Co., New York, literature; B. J. Wilson.

Railway Review, Chicago, copies of paper; Geo. E. Boyd.

Redwood Manufacturing Co., San Francisco, Cal., B. F. Wade.

Robertson & Co., Wm., Chicago, model of culvert; R. F. Repasz and W. K. Robertson.

Ruberoid Co., New York.

Sherwin-Williams Company, Cleveland, Ohio, literature and samples of paint; F. G. Sittington and O. D. Lightner.

Snow Construction Company, T. W., Chicago, literature; O. T. Snow.

Toch Brothers, Inc., New York; Dwight E. Robinson.

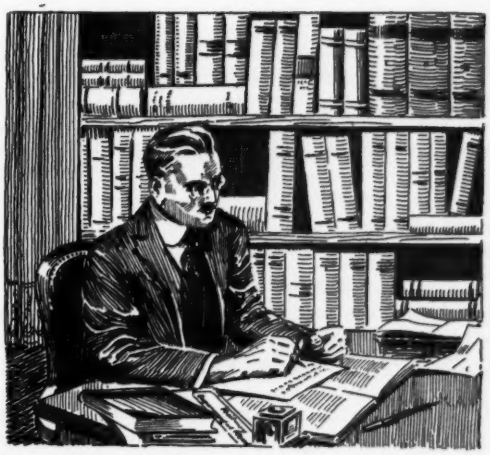
U. S. Wind Engine & Pump Company, Batavia, Ill., literature; C. E. Ward.

Volkhardt Company, Inc., The, New York, model of hydrants and parts; William Volkhardt.

W. J. Zitterell Co., Webster City, Iowa; Guy C. Mills.

At the annual meeting on Thursday morning the following officers were elected for the ensuing year: President, A. J. Filkins, Paul Dickinson Co., Chicago; vice-president, D. J. Higgins, American Valve & Meter Co., Chicago; treasurer, J. E. Nelson, Joseph E. Nelson & Sons, Chicago; secretary, B. J. Wilson, Pocket List of Railroad Officials, Chicago. Directors for term expiring in 1927: D. Hultgren, Massey Concrete Products Co., Chicago; O. T. Snow, T. W. Snow Construction Co., Chicago; W. D. Waugh, Detroit Graphite Co., St. Louis, Mo.; J. W. Shoop, The Lehon Company, Chicago. The above officers, with F. M. Condit, Fairbanks, Morse & Co., Chicago, and H. C. Brown, Chicago Bridge & Iron Works, New York, directors for the two year term expiring in 1927, constitute the board of directors.

What's the Answer?



This department is intended to help our readers secure answers to the questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. An endeavor will be made to answer promptly by mail, any questions received. Such questions as are of general interest will also be submitted in these columns for further discussion. *Railway Engineering and Maintenance* solicits the co-operation of its readers in answering the questions which are published.

Questions to be Answered in January, 1925

1. Should bridge and building painting be done by separate gangs?

2. What is the best way of lighting tunnels to facilitate the work of track and other maintenance forces?

3. What are the relative merits of the different methods of keeping underground pipe lines from freezing?

4. What is the most practical and economical method of unloading frozen cinders?

5. Should spikes which are driven tightly against the head of the rail be raised slightly prior to cold weather to avoid their breaking off in low temperatures?

6. What precautions should be taken to prevent the accumulation of ice on tracks at water stations?

7. What attention should be given water barrels on bridges to insure that they are performing their function at all times?

8. What are the relative advantages and disadvantages of concentrating the repair of work equipment such as ditchers and spreaders in a special organization under the control of the maintenance of way department as compared with turning this work over to the mechanical department? Is there any advantage in placing in charge of such work engineers who are responsible for the operation of this equipment?

Spotting in Tie Plates

When installing tie plates is it good practice to spot them in as ties are renewed or should they be inserted out of face?

First Answer

The writer considers it bad practice to spot tie plates in on curves, when renewals are made. To do so is to invite broken rails, considering that tie plates hold the gage of track more rigidly than it can be held without plates. The equipment and rolling stock on practically all the railroads is so heavy at this time that the rails are taxed to their full capacity, which makes it the more necessary for the rail on curves to be fastened so uniformly that there will be no difference in the holding power of the gage. Therefore, curves should be plated out of face when plates are installed. W. R. DAWSON.

Assistant to General Manager, Norfolk & Western, Roanoke, Va.

Second Answer

It is better to put tie plates in out of face, but the track should be smoothed up immediately behind the plates. It has been my experience in spotting in tie plates when putting in ties that unless special care is taken to get a uniform bearing on all the ties an unusually rough riding track will result although the surface of the track may not appear to be rough.

I find that when receiving ties the foreman is in a hurry to get his ties in and it is difficult to get him to smooth the track up behind the work. When using treated ties it is of course necessary to install plates when the ties are inserted. In this case the ties should be caught up and a train allowed to run over them if possible before the plate is spiked. Care should then be used to see that the shoulder of the plate is spiked square with the rail.

When putting plates in out of face the foreman should be allowed only as many plates as he can insert conveniently without interfering with his other work. He should follow up the plates with a light surface in order to protect the rail. There is also the advantage by installing plates out of face that all spikes are pulled and defective spikes replaced with new ones, making a better and safer track. W. T. PACE.

Roadmaster, Atlantic Coast Line, Live Oak, Fla.

Locks for Water Columns

Should water columns be provided with locks or other devices than those furnished by manufacturers to prevent them from being thrown across tracks?

First Answer

Water columns should not be provided with locks or any devices other than those furnished by the manufacturers to keep the columns from being thrown across tracks. Practically all of the columns on the market today are equipped with locking devices of some kind and in most cases this action is automatic. In my years of experience in water service I have known of only one or two columns that were found swung across tracks and in these cases the locks on the column were found to be inoperative through failure to keep the column in repair and not from the failure of the device itself.

Some of the columns have positive locking devices and

are unlocked by the fireman from the end of the spout and others have automatic locking devices inside of the column pit and require no unlocking except to catch the end of spout and pull it around. The column in this case revolves on a cam and is so arranged that a push by the fireman causes the spout to swing back in place and lock automatically with the spout parallel with track.

If the locking devices furnished on the columns by the manufacturers are properly maintained there should be no reason for the installation of additional locks of any kind. Such installations if made will only result in the column being damaged or torn down. W. T. PACE,
Roadmaster, Atlantic Coast Line, Live Oak, Fla.

Second Answer

The locking device furnished with water columns by the manufacturers of these columns will prevent the water columns being thrown across tracks by windstorms under all ordinary conditions.

The railway water column has been in service approximately 50 years and the automatic devices applied to these water columns by the manufacturers are a result of study and development during this period, and any improvement on this device is a matter for further development.

Some few roads have used a positive lock on water columns but the results obtained are of questionable value as a windstorm of sufficient proportion to blow a column across the track with an automatic locking mechanism in good order would certainly have sufficient force to do other damage. In other words, there is little likelihood of the water column being blown across the track unless the velocity of the wind should approach that of a hurricane.

The addition of the positive lock to the water column would further complicate maintenance and upkeep of the column and add to the duties of the engineman in taking water as well as to slow up the process of taking water.

C. R. KNOWLES.
Superintendent Water Service, Illinois Central, Chicago.

The Time to Tighten Bolts

What is the most satisfactory time of the year in which to tighten bolts out of face?

First Answer

During the winter, as a result of contraction, the expansion at some joints becomes greater than at others. Contraction due to low temperature also results in fracturing an occasional joint bolt.

The tightening of bolts out of fact is necessary during the spring, that is, following the expansion adjustment which is brought about by rising temperature. In carrying out this work in the spring the fractured bolt will be broken out during the tightening process and replaced.

R. C. WHITE.
Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

Second Answer

It is standard practice on the Buffalo, Rochester & Pittsburgh to tighten all track, frog and switch bolts out of face as early in the spring as weather conditions will permit, and the last thing in the fall before winter sets in. This is believed to be the correct practice.

E. F. ROBINSON.
Chief Engineer, Buffalo, Rochester & Pittsburgh, Rochester, N.Y.

Third Answer

Bolts should be tightened out of face during cold weather. The best results in tightening bolts out of face are obtained in the fall of the year before the rail contracts, as much expansion can be avoided and held evenly during the winter months if the bolts are thoroughly tightened before the rail begins to contract. Before tightening bolts during the summer months the bolts, as well as the joint, should be oiled with fuel oil. This will loosen the rust, allowing your bolts to tighten more easily, at the same time saving large quantities of track bolts which require cutting by track chisels when found hard to tighten. If track bolts are thoroughly tightened in this manner but little trouble will occur from bolts breaking during the winter months. Bolts should also be tightened in the early summer months after the season has become warm enough to allow the rail to expand. This practice will not only give tight joints the year around but will also save rail ends and lengthen the life of the average rail from one to three years. W. F. MUFF.
Roadmaster, Atchison, Topeka & Santa Fe, Newton, Kan.

Fourth Answer

Spring and fall, the mediums in the climatic seasons which in the northern country run from one extreme to the other, should be chosen for tightening bolts out of face.

Upon the arrival of the first few warm days of spring, the steel expands to its limit. With this movement taken care of and the rail properly balanced through self equalization, the bolts should be oiled, then tightened.

In the late fall, with its severe weather conditions, contraction takes place. The proper care of this movement having been taken and the rail again properly balanced through self equalization, the bolts should be oiled, then tightened.

In tightening the bolts, the bars should be given several sharp raps with a spiking hammer after the initial tightening has taken place. This will not only result in an assurance that the bars are not cocked against the rail but will also serve to drive off or destroy any grit or scale which might tend to obstruct a real metal-to-metal contact. The bolts should then be wrenched to a point of refusal.

If tolerance towards indifferent work is permitted in this operation, looseness of the bolts will follow either through corrosion or through vibration damaging and inducing a condition of general impairmen in all parts of the track structure adjacent to the bolt failure.

F. LISTON.
Canadian Pacific, Vandreuil Station, Quebec.

Paint for Line Gangs

Is it preferable to supply paint gangs with pigments to be mixed on the job or with ready mixed paints?

First Answer

My practice in the maintenance of way department has convinced me that it is preferable to furnish paint gangs with ready mixed paints. Paint can be mixed at a less cost and more thoroughly by machinery, also where standard colors have been adopted for an entire system there will be a more uniform shade of color than when mixed by each crew. It should be the practice to mix by formula, thus always assuring a uniform shade.

The paint gangs should be furnished paint ready for second coat work. Lead paints should not weigh less than 16½ lb. to the gallon. Lighter pigment paints such as blacks and oxides should weigh 11 to 12½ lb. to the gallon, according to the weight of the pigment. The crew should also be provided with the proper vehicle, such as turpentine, linseed oil and japan for reducing purposes.

The stock carried by the crew should not be an oversupply but enough to satisfy the amount required to cover

the surface, with a liberal allowance for leakage, etc. If a special color is desired for a certain job this should be ascertained before the crew gets on the job. If this method is followed better results can be secured at less cost. FRED C. RIEBOLDT.

Painter Foreman, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.

Second Answer

It is my experience that on some work it is better to mix the paint on the job, while in other cases it is better to ship the paint ready for use. Where first coating with red lead it is better to mix the material on the job in quantities that will last the gang two or three days. If the work requires a large quantity of paint and all of it is mixed before starting the job, settlement will take place and the coating will not work as free as fresh mixed lead. I prefer to send to the job ready for use the black for finishing coats on iron and steel work.

On station buildings, signal towers and roadway buildings it is better to mix the material on the job as the condition of the buildings requires different thicknesses or weights per gallon. Perhaps also the building is so located that grease accumulates on it. In such cases, the surface should have a coating containing more turpentine than desired for a building where this condition does not exist.

Temperature conditions must also be taken into consideration in determining the weight per gallon as in low temperatures it is necessary to use more paint thinner than required in warm weather.

Mixing the paint on the job also makes it easier to take care of the charges for material used, as it is necessary to charge out separately the lead, oil, turpentine and other materials that make up the paint. H. E. CONRAD,

Master Painter, Pennsylvania, Huntingdon, Pa.

Inspecting Flat Tank Hoops

Is it possible to ascertain the condition of flat tank hoops without removing them from the tank? If so, how?

First Answer

Having arrived at the conclusion that it is impossible to make a proper inspection of the flat hoops for water tanks while they are in service, the Baltimore & Ohio is making all renewals of these hoops with half-round hoops. E. G. LANE.

Engineer Maintenance of Way, Baltimore & Ohio, Baltimore.

Second Answer

The condition of flat tank hoops may be ascertained by testing them with a prick punch—a carpenter's nail set will serve the purpose. If the hoops are readily punctured with the punch or if the holes thus formed show that only a small amount of solid material remains, the hoop is in a dangerous condition. This test can be readily made from a ladder set up at different points around the circumference of the tank.

Third Answer

No practicable way has been found on the Oregon Short Line to get accurate information as to the condition of flat steel tank hoops while they are in place on the tank. We have had a comparatively small amount of breakage in these hoops due to corrosion, and hoops which have been up for a considerable number of years have been found to be in good condition when the tanks have been taken down.

We have always made a practice of coating the inside of hoops heavily with red lead before their application and our experience shows that this coating will last for many years. D. S. MEADOWS.

Engineer, Bridges and Buildings, Oregon Short Line, Salt Lake City, Utah.

Repairing Fences in Winter

To what extent is it practicable to build or repair fences during the winter?

The ability to build or repair fences during the winter months depends largely upon the severeness of the weather. I have observed that when conditions were such that section gangs can accomplish little in track work, attempts to do fence building and repair work have proved expensive. It is proper to do the repair work on right-of-way fences required to prevent injuries to stock during the winter months, but it is not practical to undertake the general repair and building of fences during the winter, especially after the ground has become frozen to an extent that obstructs progress and adds to the expense.

W. F. MUFF.

Roadmaster, Atchison, Topeka & Santa Fe, Newton, Kan.

Starting Motor Cars in Cold Weather

How should one proceed to start a motor car on a cold morning?

First Answer

If the following suggestions are carried out, there should be little trouble getting the cars started in cold weather. First of all, the car should be in good operating condition. The car may be primed, but not too much as there is danger of flooding, and then if a hot rag or hot bag of sand is wrapped around the carburetor and intake manifold, the car should start immediately. Many motor car operators pour hot water on the carburetor and intake manifold, but there is danger of getting water in the carburetor. Also in zero weather the water may freeze before the car is started, which makes conditions worse. J. R. WATT.

General Roadmaster, Louisville & Nashville, Louisville, Ky.

Second Answer

The wide variance in types of motors presents a range of possible solutions to this problem. My experience, principally with motors of the four-cycle type, is that the best way of starting on a cold morning is to prime the cylinders with raw gasoline or gasoline to which a few drops of ether has been added for each cylinder. The motor should first be revolved for a few times with the ignition grounded. This operation loosens up the oil-congealed moving parts and leaves a film of oil on the cylinder walls which greatly facilitates cranking when starting. A priming cup full of gas or the gas-ether mixture should then be admitted into each cylinder through the priming cups, immediately following which the motor should be cranked, so as to prevent the gas from seeping past the pistons with the resultant dilution of the lubricating oil in the crank case. This will usually start the motor. To keep it running the air intake valve or choke should be kept closed until the motor has warmed up sufficiently to volatilize the regular running mixture. After the car has been operated for a mile or so, subsequent startings on a cold day, if not too long delayed, can be accomplished by closing the choke and proceeding in the ordinary manner.

When cars are not provided with priming cups it is necessary to remove the spark plugs to introduce the "prime" into the cylinders. In starting a direct drive

car on frosty or icy rails, the weight of a man on the car has been found sufficient to give the driving wheels traction to crank a cold motor.

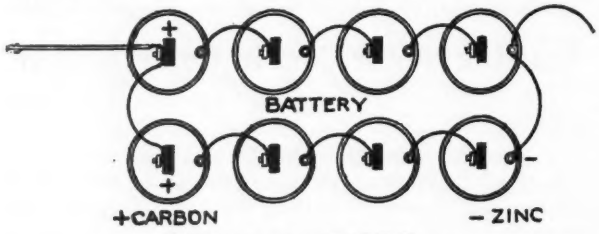
A. PERRY EVERSTINE.
Bessemer & Lake Erie, Greenville, Pa.

Third Answer

When one experiences trouble starting railway motor car engines in cold weather the following suggestions should be of assistance: These suggestions refer chiefly to engines using jump spark coil ignition, most of which are of the two-cycle type. Persons having cars with four-cycle engines and magneto ignition, should consult the magneto manufacturers' instruction for the particular magneto with which the engine is equipped.

(1), Start the cold season with new dry cells. They should test 25 amperes or higher when new and should be discarded and replaced when they register less than 8 amperes.

(2), Be sure that all ignition wires are in good condition, not broken. If dirty-covered with grease or oil



The Arrangement of Cells

—they should be cleaned with gasoline, dried and coated with shellac, or replaced with new wires. Ignition wires, particularly the high tension wire, running from the spark coil to the spark plug should not touch any metallic part of the engine, especially moving parts that may wear the insulation, causing a short circuit.

(3), Locate the battery box so that the wires are as short as possible, particularly the high tension wire.

(4), Terminal connections should be clean and tight, but care must be taken not to tighten the nuts to an extent where the bolt turns also. The terminal post connections inside some spark coils are soldered to the coil leads and will be broken off if the terminal post is turned. Never open up the coil box to repair it, for only one equipped with the proper facilities can make repairs inside a jump spark coil.

(5), The jump spark coil vibrator points should be kept clean, flat and so trimmed that they make contact over their full face. This can best be done with a magneto file or fine emery cloth by removing only a small amount of metal each time.

(6), Most jump spark coils are made for use with a six volt battery. Four dry cells in good condition will produce this voltage. In extremely cold weather it may be necessary to use five and not more than six dry cells to produce the desired results. If more than six dry cells are required, eight should be used and they should be wired up in series parallel, as shown below, and in no other manner.

(7), The coil vibrators should be set with as light a tension as will produce ignition, thereby holding down the current pull on the battery. The vibrator should be near the core of the coil and not in contact with it.

(8), Never buzz the coil until it is grounded for the high tension spark produced. The high tension wire should be connected between the coil and the plug and the plug should either be in or on the cylinder, so the spark can ground without jumping a gap longer than 3/16 in. Never draw out the spark longer than 3/16 in. as the coil may be ruined in so doing.

(9), The spark plug should be examined to see that the porcelain is not broken and that it is clean and protected by a gasket inside the shell. The porcelain or center electrode should be tight in the porcelain. The points should not be more than the thickness of a worn dime apart, and should be clean and not burned out. When inserting a cold plug in a hot cylinder the threads should be given a drop of oil and then put into the cylinder loose enough to allow expansion of the plug shell and porcelain. If this is not done the expansion may crack the porcelain. Apply the porcelain terminal nut lightly, so as not to turn the shell electrode in the porcelain.

(10), When satisfied that the ignition is in good condition, the engine should be examined to see if it has good cylinder and crank case compression; and clean exhaust and intake ports, if a two cycle engine. On four cycle engines as well as two cycle engines care should be taken to see that intake manifolds are tight, that carburetors or mixing valves are in good condition and properly adjusted to deliver the right mixture of air and gas to produce a combustible mixture.

(11), Most engines are equipped with priming cocks, so they may be given a priming charge when starting, using high test gas. In cases where the engine is hard to get started, ether may be used.

(12), Water cooled engines if hard to start should have all the cold water drawn off and hot water put into the radiator or hopper, this ought to make the engine easy to start in cold weather.

(13), When air cooled engines are hard to start, hot sand bags, hot stones or damp hot rags should be placed over and around the cylinders, intake manifolds and around the bowls of carburetors. *It is bad practice to heat up these parts with an open flame of any kind.*

(14), Engines using dry cell jump spark ignition, when difficult to start in the morning, should have the dry cells taken into a warm room where they will be kept at room temperature over night. This will assist in starting the engine in the morning.

(15), All connecting wires on the ignition system should be tested, especially those connecting up the several dry cells in the battery, these often are broken under the insulation, which is hard to detect. A search should also be made for loose terminal posts on the individual dry cells. Packing should never be used around the dry cells as it will absorb moisture and short the dry cells. In sections of the country where the air is damp, making it difficult to keep the paper cartons around the dry cells from absorbing moisture, it might be advisable to dip each in hot paraffin to make the carton waterproof. In damp country it is also advisable to ground the negative (zinc) side of the dry cells, not the positive (carbon) side.

(16), When putting away two-cycle engines for the night it is advisable to put the piston up against compression so that the piston covers the intake and exhaust ports, to keep out cold air, frost and moisture.

(17), Cold engines having no priming cocks may be primed by removing the spark plugs and shooting a spray of high test gas through the spark plug hole with a blow torch or an atomizer of any kind. Before inserting the spark plug it may also be heated, putting a few drops of gas on it before insertion.

(18), Gasoline used in priming, and in fact all gasoline, should be kept in storage which is cool, to prevent the lighter fractions of the gas from evaporating; it is those light fractions of the gas which are so necessary

in starting an internal combustion engine when cold.

(19), If the engine does not start after priming several times, it may be that the mixture is too rich. The engine should then be turned over several times with the carburetor turned off to get some air into the cylinder with the gas then in it.

(20), If the engine fires the priming charge then dies down, the carburetor may be delivering too rich a mixture. The remedy is to close the needle valve slightly and start all over again. It may also be that the gas line is frozen up due to water being in the gas line or in the carburetor. The remedy is to open up the carburetor bowl drain cock and drain off enough gas to get out all the water, and observe if the bowl again fills with gas when the float is depressed. If it does not, it may be necessary to take off the gas line and clear it of obstructions. One should also check up to see if there is any obstruction in the needle valve port, for sometimes this opening fills up with waste, dirt or even with a small icicle. C. H. ORDAS.

Supervisor of Motor Cars, Chicago, Milwaukee & St. Paul, Chicago.

Spacing Ties on Bridges

Is the dapped guard or fender timber on bridge floors preferable to other means of spacing ties or securing them against bunching?

First Answer

The practice on the Great Northern consists of using a 4-in. by 8-in. outer guard rail, secured to each tie by means of a ⅝-in. by 8-in. lag screw. We believe this to be the best detail for fastening guard timbers. For many years prior we dapped the outer guard rail from 1 in. to 1½ in. over the ties but the blocks between the ties invariably sheared off and it was not uncommon to find fully one-half of these entirely missing. Apparently the dapping was really of no use.

The recommended practice of the American Railway Engineering Association eliminates the dapping and calls for the plain guard, lag screwed to ties, which agrees with our practice. H. A. GERST.

Assistant Bridge Engineer, Great Northern, St. Paul, Minn.

Second Answer

The dapped guard rail has been objected to as a means for spacing ties on account of the tendency of the lugs between the daps to break off. However, where both guard rail and ties are of untreated timber, the life of guard timber is not determined by the daps but by the amount of damage done to it in its repeated removal for the purpose of renewing ties, since a few ties must be renewed from time to time before it is necessary to replace the deck out of face. Another cause of deterioration of the guard timber other than the breaking off of the lugs is rot at the end joints whether butted or halved.

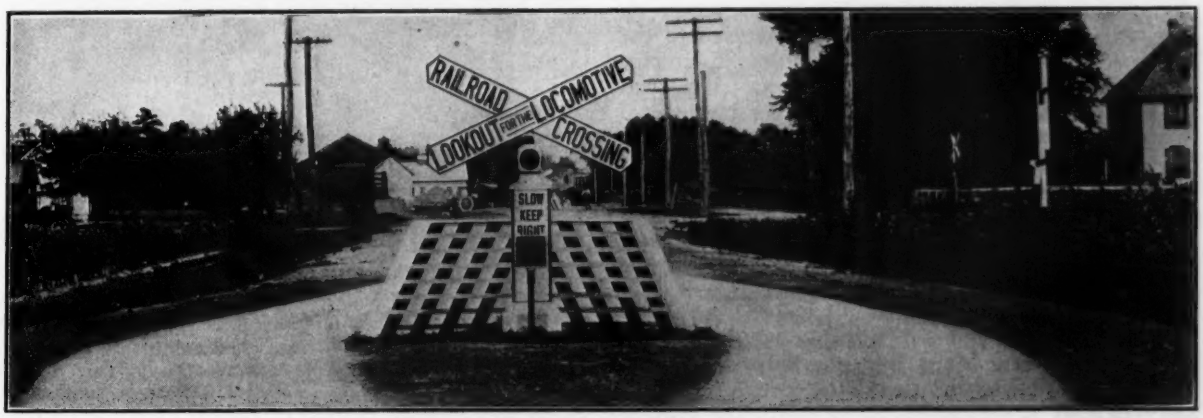
An effective substitute for the dapping of guard rails as a means of spacing ties that has been used on steel bridges is to introduce spacing blocks between the ties directly over the girders or stringers. These are beveled downward on the top both ways from the center and perform the added function of protecting the top of the steel from brine drippings.

A Combined Crossing Sign and Barrier

AT COOL SPRING, DEL., at either side of the crossing of the Pennsylvania Railroad, the highway department of the State of Delaware has erected in the highway a combination sign-warning and a partial barrier, designed to induce caution on the part of automobile drivers. This barrier is fixed 75 ft. from the track and there is a duplicate on the other side of the railroad to warn road traffic moving in the opposite direction. The main features of the device are the regulation crossing sign, set in the middle of the road, and a substantial barrier extending 12 ft. across the highway. The barrier is about 4 ft. high and consists of boards 4 in. wide fastened to wooden posts. The structure is fixed in a vertical position, like a fence, the appearance of an inclined plane being produced by the black and white stripes put on by the painter.

The roadway is widened to provide space for the barrier and the carriageway, of concrete, is 10-ft. wide on either side. For the protection of night drivers a flashing acetylene light is provided. This flashes 45 times a minute. Below the flashing light is a rectangular red mirror which reflects the lights of approaching automobiles at night. Thus there are five different warnings: (1) the bend in the road; (2) the flashing light; (3) the red reflector; (4) the standard crossing signal at the top, and (5) the black and white lattice work.

The 12 ft. panel of board fence is 8 ft. 5 in. long at the top. It consists of eight 1 in. boards, 4 in. wide, spaced 2 in. apart, and held together at the center and two ends by two pieces of plank. This method of construction was carried out with the view of making this fence strong enough to withstand any ordinary pressure, such as wind, but at the same time frail enough not to wreck an automobile which might accidentally strike it.

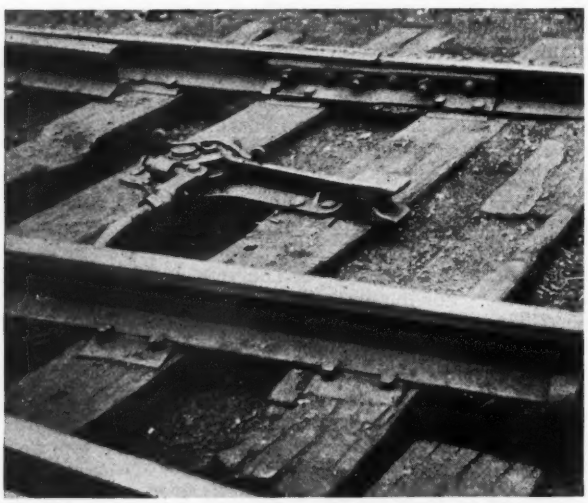


Highway Crossing Warning at Cool Spring, Delaware, on the Pennsylvania

New and Improved Devices

Parallel Throw Switch Stand Takes Up Very Little Space

ONE OF THE interesting developments of the war was a special switch stand for use on light railways at the front which had a total height of 3 in. and no working parts below the top of the ties. This was subsequently re-designed along heavier lines for use in standard railway service by its manufacturers, the Bethlehem Steel Company, Bethlehem, Pa. This heavier model has only three working parts and a total height of 4¾ in. from the top of the tie to the base of the lamp. The throwing lever moves in a direction parallel to the track and is weighted at the end. It pivots on a fixed base which also carries the crank arm, swivelling or turning on a pin fastened to the base. This crank arm is slotted vertically to receive a metal block which is pivoted on the throwing lever.



The Stand is of Very Compact Construction

This combination forms the actuating mechanism that moves the switch rod and thus the switch points, the operation being about as follows. When the lever is thrown from one horizontal extreme to the other, the pivoted block is moved through half a circle, its total horizontal travel being that of the diameter of the circle and its vertical movement that of the radius.

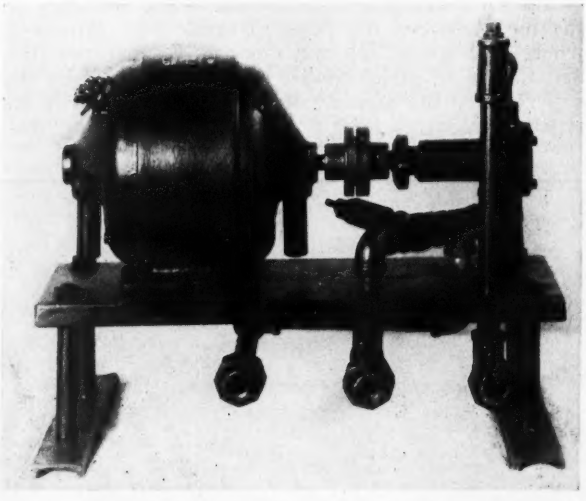
The vertical movement is readily taken care of by permitting the block to slide up and down in the slot. The throwing force comes from the horizontal movement forcing the block against the sides of the slot and thus causing the crank arm to turn. The amount of throw is regulated by a screw eye adjustment. As the metal block is square, new full-sized wearing surfaces can be obtained by giving it a quarter turn. There are no latches as the throwing lever is on dead center when in a normal position. However, means have been provided for padlocking the stand. It is also practically self-cleaning and simple to dismantle. Results obtained with this type of stand in yards and terminals show that a long service life is regularly attained. In one yard where the switching is exceedingly heavy, one of these stands has been thrown over 625,000 times to date and in another yard a similar stand has been thrown over 300,000 times since the installation.

Melting Snow With Fixed Oil Burners

A NEW development in snow fighting appliances has recently been brought out by the Chausse Oil Burner Company of Elkhart, Ind., in a kerosene or distillate-burning switch and interlocking plant heater. This apparatus has been tested out by several steam railroads and additional installations are being arranged for the coming winter.

As shown in the accompanying illustrations, this heater consists of a standard Chausse burner such as is used on railroad kerosene torches, applied to a heater element 10 ft. long. The latter is made from 2-in. steel pipe, perforated at 4-in. intervals and with a spacer-deflector between the heater and the rail head. The whole appliance is held in place by brackets attached to the ties.

In operation it has been found that this equipment keeps a space from 15 to 18 in. wide clear of snow and ice on both sides of the rail or switch. The heat is not sufficient, however, to affect the rail and the hand can be



The Motor Driven Pump Unit.

placed on the rail at any point without discomfort. There is practically no visible white or yellow flame, so that no interference with low targets is experienced at night. The appearance is similar to that of a gas stove with a light blue flame.

The normal flame of the burner itself is about 18 in. long but in the heater this stretches out for 10 to 20 ft. without the application of any added pressure. While the usual installations are made in 10-ft. lengths, other lengths up to 20 ft. can be used. The far end of the heater duct is closed.

An Installation at a Power Operated Switch.

Pressure on the distillate or kerosene is furnished at 12 lb. per sq. in. by a ¼ hp. motor-driven pump, as shown in the photograph. This is enclosed in a sheet iron housing. The pump has a capacity for about 100 burners or 50 switch installations. A pressure release valve permits oil to flow back into the tank when the pressure in the line exceeds 12 lb. This enables the maintainers to start the motor against a dead head and then as each burner is lighted, the flow of oil through the pipe line commences. Air-tight storage tanks are unnecessary, and open delivery drums can be used, although on large installations it is preferable to provide buried storage tanks. The service system consists of ⅜-in. black iron piping from the storage tank to the pump and thence to the burners.

The cost of operation amounts to from seven to nine cents per hour per heater, depending on the cost of furnace oil or distillate. Each burner consumes from ¾ gal. to 1 gal. per hour, costing therefore from 14 to 18 cents per switch, or 28 to 36 cents per cross-over (4 heaters). The cost of running the 110-volt, ¼-hp. motor depends on the cost of current. For places where electric power is not available the pump may be equipped with a small gasoline motor-driven unit. It is said that the total cost of operation with oil is about half that involved in the use of electric heaters.

A Snow Melting Installation for Keeping Switches Open

ONE OF THE recent developments in equipment designed to enable the railways to keep their switches open and in operation during the heavy snows of the winter season with a minimum of manual labor, is an installation of nozzles along the switches, by means of which hydrocarbons and other low flash oils are ignited and discharged at and around the switch points. The operation is controlled by valves at the various switch installations, the oil being lighted by special ignitors. One man's attention is required for a fraction of a minute and approximately once an hour, thus permitting one man to care for a large number of switches.

The installation for a standard switch consists of two short lines of one-inch pipe mounted on brackets along the ends of the ties, each line carrying five or more plain nozzles according to conditions and two special ignitors with nozzles directed toward the outside of the running rails. These two lines of pipe are connected together and to a feeder line from the oil supply. The connection between the two lines is electrically insulated. The oil supply is generally in the form of a tank for a large number of installations but ordinary "drums" are often used at smaller installations. The required pressure is obtained by elevating the tank at a minimum of about 10 ft. above the level of the nozzles. The plain nozzles are directed toward the ball of the rail and are located between the ties. The special nozzles and ignitors are located at the ends of the installation and are arranged so that on each line, one ignitor is on the inside and one on the outside of the running rail, each pointing toward the other. This arrangement secures the ignition of the oil discharged from the plain nozzles independently of the direction or intensity of the winds.

Each ignitor consists of a small oil well in which is mounted a wick projecting up through an oil tight fitting. The oil from the feed line passes through this well and up to a nozzle mounted above and at one side of the wick and so pointed as to direct the oil spray from it across the wick which is kept lighted at all times during the use of the device.

The Nozzles Are Set Along the Outside of the Rails. The Inside Ignitor Nozzles Are Just Ahead of the Switch Points.

tion of heating the switches is done by opening the valve for a period of from 5 to 10 seconds. The oil spray passing over the wicks is at once ignited and these streams of burning oil in turn ignite the oil from the remainder of the nozzles. In actual operation this ignition is practically instantaneous and produces a low-burning flame with the heat concentrated around the working parts of the switch. This one operation keeps the switches open for about an hour and requires a maximum consumption of oil of approximately 1½ gal. per hour per switch. As a general rule it has been found that one man can care for several single switches.

This type of snow-melting equipment was developed by James Greer, gas engineer on the Delaware, Lackawanna & Western, and is manufactured by the Greer Specialties Company, Hoboken, N. J.

With the Associations

American Railway Engineering Association

In the course of the month it is expected to have two more bulletins in the mail, one, containing the report of the joint committee on concrete and the other containing miscellaneous information, including the revised regulations of the Government for drinking water supplies.

Among the applications for membership which have been received are those from 11 railroad presidents, which increases the number of such members in this association to 33.

Maintenance of Way Club

The Maintenance of Way Club of Chicago held its fourth annual meeting on October 15 with 97 members and visitors in attendance. Following a dinner the group was addressed by C. A. Morse, chief engineer, Chicago, Rock Island & Pacific. The meeting was also addressed by the retiring president, F. W. Hillman, division engineer, Chicago & North Western. The following officers were elected for the ensuing year: President, Tom Thompson, roadmaster, Atchison, Topeka & Santa Fe, Joliet, Ill.; first vice-president, D. O'Hern, roadmaster, Elgin, Joliet & Eastern, Joliet, Ill.; second vice-president, William Hogan, roadmaster, Baltimore & Ohio Chicago Terminal, Chicago; secretary-treasurer, W. S. Lacher, managing editor, *Railway Engineering and Maintenance*, Chicago; member of the executive committee, J. J. Desmond, roadmaster, Illinois Central, Chicago.

The Wood Preservers' Association

The nominating committee has recommended the following members of the association for election at the next annual meeting in February: President, S. D. Cooper, assistant manager of treating plants, A. T. & S. F., Topeka, Kans.; first vice-president, C. F. Ford, supervisor tie and timber supply, C., R. I. & P., Chicago; second vice-president, O. C. Steinmayer, manager, Canada Creosoting Company, Toronto, Ont.; secretary-treasurer, P. R. Hicks, manager Service Bureau, American Wood Preservers' Association, Chicago. Members executive committee: E. S. Park, vice-president and general manager, New England Wood Preserving Company, Nashua, N. H.; Galen Wood, chemist, Port Reading Creosoting Plant, C. R. R. of N. J.-P. & R., Port Reading, N. J.

International Track Supervisors' Club

The regular meeting of the International Track Supervisors' Club was held on October 9, at the Royal Connaugh Hotel, Hamilton, Ontario, Canada. The meeting was preceded by a luncheon following which papers were presented by A. M. Clough, track supervisor on the New York Central, Batavia, N. Y., and G. H. Allen, Canadian National, on the subject of Benefits Received from Treated Ties With and Without Tie Plates.

The Material Market

AS WOULD naturally be expected, the formal notice by the Federal Trade Commission instructing the manufacturers of iron and steel to desist in their observance of Pittsburgh as the basing point in determining their prices, as announced briefly in last month's issue, was effective in producing considerable confusion in the market throughout the early part of October. As price levels represent the net result of complex business relationships no little time elapsed before definite quotations were given out on the new basis since each individual producer was anxious for his neighbor to take the first step. However, once the start was made a readjustment followed and stability has now been fairly well restored. The effect of the change will be noted in only a few items in the tables of prices below, since structural steel and track materials had been for some time substantially on an f. o. b. mill basis. However, in the case of wire and wire products where Chicago prices were formerly 34 cents per 100 lb. in excess of Pittsburgh prices, they are now only 10 cents higher.

PRICES PER 100 POUNDS

	September		October	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.80	$2.80 to $3.00	$2.70 to $3.00	$2.80
Track bolts	3.75	3.80 to 4.00	3.75 to 4.00	3.80
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.50	2.45	2.40 to 2.50	2.30
Boat spikes	3.25		3.00	3.00
Plain wire	2.55		2.50	2.60
Wire nails	2.80		2.75	2.85
Barb wire, galv.	3.50		3.45	3.55
C. I. pipe, 6 in. to 12 in., ton		53.20		50.20
Plates	1.80 to 2.00	2.10 to 2.15	1.80 to 1.90	2.00 to 2.10
Shapes	2.00 to 2.10	2.10 to 2.15	1.90 to 2.00	2.00 to 2.10
Bars, soft steel	2.00 to 2.10	2.00 to 2.10	2.00 to 2.10	2.00 to 2.10
Rivets, struct.	2.60		2.60	2.75
Open hearth rails, per gross ton, f. o. b. mills				$43.00

The scrap market has failed to hold the full volume of the advance made during the month of September, although the present prices are moderately above those at the end of August.

PRICES PER GROSS TON AT CHICAGO

	September	October
Relaying rails	$27.00 to $32.00	$27.00 to $32.00
Rails for rerolling	17.50 to 18.00	17.00 to 17.50
Rails less than 3 ft. long	18.50 to 19.00	17.50 to 18.00
Frogs and switches cut apart	16.50 to 17.00	16.00 to 16.50
Steel angle bars	18.00 to 18.50	17.00 to 17.50

No marked change has taken place in the lumber market, which continues quiet. In both the Southern pine and Douglas fir territories the volume of current orders is moderately less than it was a year ago. On the west coast the aggregate orders for the first 40 weeks of the year equal about 90 per cent of the sales for the corresponding period of last year. The following tables show a comparison of prices for September and October on typical lumber items.

SOUTHERN PINE MILL PRICES

	September	October
Flooring, 1x4, B and B flat	$41.25	$41.10
Boards, 1x8, No. 1	35.30	34.05
Dimension, 2x4, 16, No. 1, common	26.90	25.90
Dimension, 2x10, 16, No. 1, common	27.45	27.40
Timbers, 4x4 to 8x8, No. 1	26.80	27.95
Timbers, 3x12 to 12x12, rough	33.45	32.35

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear flat	$29.00	$
Boards, 1x8, 6 to 20, No. 1, common	17.50	
Dimension, 2x4, 16, No. 1, common	18.50	
Dimension, 2x10, 16, No. 1, common	18.00	
Timbers, 6x6 to 8x8, No. 1, common	23.00	
Timbers, 10x10 to 12x12, rough	18.00	

No changes have occurred in the prices of Portland cement during the past month. The following table gives prices per barrel in carload lots, not including package.

New York	$2.15	Minneapolis	$2.42
Pittsburgh	2.19	Kansas City	2.70
New Orleans	2.80	Dallas	2.05
Chicago	2.20	Denver	2.84
Cincinnati	2.47	San Francisco	2.61

News of the Month

A commission has been appointed by the governor of Maryland, in pursuance of a recent act of the legislature, providing for governmental co-operation with the Baltimore & Ohio in furthering the celebration of the one hundredth anniversary of the granting of the charter to the Baltimore & Ohio in 1827.

L. F. Loree, president of the Delaware & Hudson and chairman of the board of directors of the Kansas City Southern, formerly an engineer maintenance of way on the Pennsylvania, has been knighted bv the King of Italy in recognition of his long and valuable service in the engineering profession and his contributions to the science of railroading.

Loss and damage claims paid by 212 principal railroads of the United States and Canada totaled $26,565,910 for the first six months of 1924, as compared with $23,225,924 for the same period of 1923, and $27,380,000 in 1922. The increase of the first six months of 1924 over the same period of 1923 is 14.4 per cent. Payments on fresh fruits and vegetables showed an increase of 77 per cent.

The longest electrified railway in Europe at the present is a line of 296 miles in Sweden where the total amount of line electrified aggregates about 500 miles with an addition of 284 miles of line now undergoing electrification. Austria while having practically no electrification at present has provided by law for the immediate electrification of lines totaling 1,143 miles. In Germany 360 miles of main line have been electrified. Electric traction has been applied to 890 miles of tramways and to 320 miles of secondary track in Italy.

Freight car loadings for the week ending October 11, the last week of record, totaled 1,088,462 cars, which was an increase over the corresponding week of last year of 2,524 cars, and only 9,031 cars below the high record for all time, established in the first week of September, 1923. Loadings of general merchandise and miscellaneous freight broke all previous records with a total of 259,617 cars, making the fifth consecutive week in which this record has been broken. On October 8 more freight cars were handled than on any other day this year.

Statistics were recently developed on the movement of agricultural products by railroads in recent years from which the statement has been made that the railroads are rendering more and better service to the grain farmers during the present grain moving season than was ever rendered in history. In the seven weeks ended on September 27, the total number of carloads of grain and grain products moved exceeded 460,000 cars. This was 121,500 more than in the corresponding weeks of 1919; 157,000 more than in 1920; 61,000 more than in 1921; 84,000 more than in 1922 and 87,000 more than in 1923.

As a result of the establishment of an industrial fellowship at the Mellon Institute of Industrial Research, Pittsburgh, Pa., by the Grasselli Chemical Company, Cleveland, Ohio, which has been vested in A. M. Howald, a process has been developed whereby timber can be treated by pressure process in one operation with an emulsion of zinc chloride and petroleum oil. The objective of this research has been to utilize the preservative value of zinc chloride and to waterproof the timber so treated with the petroleum oil. Following experiments in the laboratory, further tests have been in process for several weeks at the Somerville, Tex., plant of the Atchison, Topeka & Santa Fe. Approximately 25 railway and timber treating engineers visited this plant and observed these tests on October 17. About 3,000 pine, oak and gum ties will be treated with this process at this plant in the next two or three months and an opportunity will be afforded for the inspection of these additional ties at an early date.

The National Safety Congress, comprising those representatives of steam and electric railroads and of other industries and associations who are engaged directly or indirectly in the promotion of the health and safety of the public and of employees, held its thirteenth annual congress at Louisville, Ky., from September 29 to October 3, inclusive. About 100 were present at the sessions of the Steam Railroad section where papers and discussions were held on special railway safety problems and work. New officers of this section are: Chairman, Charles E. Hill, New York Central; vice-chairman, H. A. Rohweder, Duluth, Missabe & Northern, and secretary, J. Newman, Union Pacific.

The anticipated test of the powers of the United States Railroad Labor Board under the Transportation Act was begun in Chicago on September 29 when a petition was filed with the United States District court by the labor board asking that John Maguire, general chairman of the Brotherhood of Locomotive Engineers on the Chicago & North Western, and O. B. Robinson, president of the Brotherhood of Locomotive Firemen and Engineers, be compelled to testify before the board. These two men, as well as a number of other brotherhood officers, had twice ignored orders of the labor board to appear and testify in a controversy with the western railroads over proposed changes in wages and working rules.

The International Railway Congress will convene in London on June 22, 1925. The program of this meeting includes the presentation of a report by G. J. Ray, chief engineer of the Delaware, Lackawanna & Western, on highway grade crossings; a report by W. C. Cushing, engineer standards, Pennsylvania, on rail joint and rail failures; a report by S. T. Wagner, chief engineer of the Reading, on yards and switching; a report by R. W. Bell, general superintendent of motive power, Illinois Central, on locomotive terminals, and a report by J. T. Loree, vice-president and general manager of the Delaware & Hudson, on statistics.

A statement has been issued by the Pennsylvania in which this road lays claim to being the first railroad in America, in opposition to the generally accepted conclusion that this distinction goes to the Baltimore & Ohio. Colonel John Stevens, who is declared to be the father of the Pennsylvania railroad (having been the first to conceive of the project) secured a charter from the legislature of New Jersey as early as February 6, 1813, for a railroad from New Brunswick to Trenton, which is on the line now occupied by the Pennsylvania. Failing in effecting this construction Stevens went to Pennsylvania, where he received a charter from the Pennsylvania legislature on March 21, 1823, incorporating "The Pennsylvania Railroad Company." This charter provided for a line from Philadelphia westward to Columbia on the Susquehanna river. Progress was made in 1823 and 1824, but little was accomplished until April 27, 1826, when the Pennsylvania legislature incorporated another road known as the Columbia, Lancaster & Philadelphia, which is cited as being a continuance of the scheme of Colonel Stevens. On March 24, 1828, the legislature voted $2,000,000 for the construction of the line and in April, 1828, three months before ground was broken on the Baltimore & Ohio, location surveys were started and in 1829, 40 miles placed under contract for immediate construction.

Personal Mention

General

E. R. Parke, supervisor of track on the Pennsylvania, with headquarters at Millersburg, Pa., has been promoted to assistant passenger trainmaster on the New York division.

C. H. Buford, superintendent on the Chicago, Milwaukee & St. Paul, and formerly an engineering officer, has been promoted to general superintendent of Southern district, with headquarters at Chicago. He entered railway service as engineer of track elevation on the Chicago, Milwaukee & St. Paul, with headquarters in Chicago. He was promoted to trainmaster of the Sioux City and Dakota divisions in April, 1917, and since that time has served consecutively as trainmaster and superintendent at various points until his recent promotion to general superintendent of the Southern district.

Engineering

M. I. Dunn, Jr., assistant division engineer on the Chesapeake & Ohio, with headquarters at Clifton Forge, Va., has been transferred to Richmond, Va., succeeding **R. L. Kittredge.**

R. E. Dougherty, designing engineer on the New York Central, with headquarters at New York, has been promoted to the staff of the vice-president with the title of special engineer with the same headquarters. **W. C. Maurice** has been appointed assistant engineer, with headquarters at Albany, N. Y., succeeding **J. G. Brennan,** who has been promoted engineer of grade crossings, with headquarters at New York, to succeed **G. A. Noren,** promoted to designing engineer, succeeding Mr. Dougherty.

W. J. Harris, division engineer of the La Crosse division of the Chicago, Burlington & Quincy, whose promotion to engineer maintenance of way of that division, with headquarters at La Crosse, Wis., was reported in the September issue, was born on September 3, 1883, at Danville, Mo. He entered railway service in 1906 as a rodman on the Chicago, Burlington & Quincy, where he became instrumentman a year later. In 1910 he became a division engineer and held this position until 1913 when he was promoted to resident engineer. He was re-appointed division engineer in 1916 and was holding this position at the time of his recent promotion to engineer maintenance of way of the La Crosse division.

W. J. Harris

F. S. Hales, assistant engineer on the New York, Chicago & St. Louis, has been promoted to engineer of track of the Nickel Plate district, with headquarters at Cleveland. He was born at Wilson, N. C., on April 13, 1893, and was educated at the North Carolina State College and Cornell University, receiving the degree of civil engineer from the latter in 1916. He was engaged as an instrumentman on drainage projects in North Carolina during 1914 and 1915 and entered railway service in June, 1916, as an instrumentman on grade crossing elimination on the New York, Chicago & St. Louis. He served as a draftsman on bridge and track layouts from October 1, 1916, to June 26, 1918, when he entered military service. Returning to the Nickel Plate on September 26, 1918, he served as a designer on grade crossing elimination until November 1, 1919, and from then on as an assistant to the chief engineer of the corporation on work connected with federal control settlements until April 1, 1920, when he was promoted to assistant engineer of design. He became assistant engineer of track on April 15, 1924, and was serving in this capacity at the time of his promotion to engineer of track.

Alvin Case Harvey, assistant chief engineer of the Nickel Plate district of the New York, Chicago & St. Louis, whose appointment also as assistant chief engineer of the Lake Erie & Western district, was announced in the October issue, was born at Mansfield, Ohio, on December 24, 1883, and received his engineering education at Purdue University, from which he graduated in 1908. He entered railway service in December, 1902, as a rodman on the New York, Chicago & St. Louis at Fort Wayne, Ind., where he served continuously as rodman until December, 1904, and thereafter intermittently as rodman at Cleveland, as a draftsman in the chief engineer's office and as a steel inspector at Cleveland, until his graduation from Purdue University, when he entered the permanent employment of the Nickel Plate, serving as a rodman and transitman on station ground surveys until March, 1909, and thereafter as an assistant engineer at various points until June, 1916, when he was placed in charge of grade crossing elimination at Cleveland, Ohio. He continued to serve as engineer in charge of various projects of a similar character from then on until December, 1921, when he was promoted to assistant chief engineer of the Nickel Plate district. His jurisdiction was extended over the Lake Erie & Western district in September of this year.

J. K. Conner, chief engineer of the Lake Erie & Western district of the New York, Chicago & St. Louis, whose appointment also as chief engineer of the Nickel Plate district, with headquarters at Cleveland, Ohio, succeeding **W. J. Bergen,** was announced in the October issue, was born at Wabash, Ind., on April 12, 1871, and studied two years in Rose Polytechnic Institute. He was engaged in county and municipal work from 1891 to 1895, when he entered railway service as an assistant engineer on the Michigan division of the Cleveland, Cincinnati, Chicago & St. Louis. He served in this capacity and as supervisor of track on the Michigan division until July 26, 1899, when he entered the employ of the Baltimore & Ohio Southwestern as an assistant engineer. On April 1, 1901, he entered the service of the Lake Shore & Michigan Southern, now a part of the New York Central, where he served as a bridge draftsman and designer until February 7, 1903, when he became resident engineer on the Chicago & Southwestern. He relinquished this position on March 28, 1903, to become an assistant engineer on the Lake Erie & Western, and continued in this capacity and as a division engineer with this company until September 20, 1905, when he returned to the Lake Shore & Michigan Southern as an assistant engineer. He served in this capacity until April 1, 1906, when he became first assistant engineer on the Lake Erie & Western, the position he held until February 10, 1914, when he was promoted to chief engineer of that road, which was later acquired by the New York, Chicago & St. Louis.

R. E. Caudle, assistant engineer of structures of the International-Great Northern, with headquarters at Palestine, Tex., has been promoted to district engineer, with headquarters at Houston, Tex., succeeding **C. R. Byram,** who has resigned. **M. B. Kent,** assistant engineer, with headquarters at San Antonio, Tex., has been promoted to assistant engineer of structures, with headquarters at Palestine, succeeding Mr. Caudle. **S. J. Leseuer,** assistant engineer, with headquarters at Palestine, has been transferred to San Antonio, succeeding Mr. Kent.

Mr. Caudle was born on August 10, 1886, at Clarksville, Tex. He entered railway service in 1905 as a chainman on the Kansas City, Mexico & Orient at Sweetwater, Tex., and subsequently held various positions in the engineering department of that road. He was appointed assistant engineer on the Texas & Pacific in 1911 and was promoted to division engineer in 1913. Mr. Caudle entered the service of the International-Great Northern in 1916 as assistant engineer. He was promoted to division engineer in 1917 and in 1918 was promoted to general foreman of bridges and buildings and water service. He was again appointed division engineer in 1919 and held that position until 1921, when he was promoted to assistant engineer of structures. Mr. Caudle served in that capacity until his recent promotion to district

Track

E. C. Dunlop has been appointed roadmaster on the Canadian National, with headquarters at Portage La Prairie, Man.

F. P. Ryan has been promoted to roadmaster of the Third district of the Midland Valley, with headquarters at Muskogee, Okla., to succeed **Frank Graham.**

J. F. Campbell has been appointed acting roadmaster on the Missouri Pacific, with headquarters at Gurdon, Ark., to succeed **J. Y. Dollar,** resigned.

V. E. Parker has been appointed acting roadmaster of the Klamath district of the Southern Pacific, Pacific system, with headquarters at Klamath Falls, Ore., to succeed **L. E. Petersen,** who has been transferred to the Redding district, to succeed **C. H. Neal,** who has been granted leave of absence.

Lee Southerland, general ballast foreman on the Jacksonville district of the Southern Pacific, has been promoted to roadmaster of this district, with headquarters at Jacksonville, Tex., to succeed **E. H. Shirley,** who has been transferred to the Texas & New Orleans, a subsidiary of the Southern Pacific, to succeed **A. W. Baxley,** who has been granted leave of absence.

J. D. Wallace has been promoted to supervisor of track on the Columbus branch of the Atlanta division of the Southern, lines west, with headquarters at Williamson, Ga., to succeed **W. L. Fillyaw,** deceased. **J. B. Austin** has been promoted to supervisor of track on the Birmingham division, with headquarters at Birmingham, Ala., to succeed **R. W. Thompson,** assigned to other duties.

Frank Kubitza has been promoted to roadmaster on the Montana division of the Great Northern, with headquarters at Havre, Mont., and jurisdiction from Havre to Cutbank, to succeed **John Torkelson,** who has been transferred to roadmaster, Cascade division, with headquarters at Everett, Wash., and with jurisdiction from Skykomish, Seattle, in place of **H. S. Sheldon,** who has been granted leave of absence.

A. L. Anderson has been promoted to roadmaster on the Ottumwa division of the Chicago, Burlington & Quincy, with headquarters at Osceola, Iowa, and jurisdiction from Des Moines, Iowa, to Cainsville and from Indianola Junction to Indianola, to succeed **B. A. Terhune,** who has been transferred to the Centerville division, with headquarters at Centerville, Iowa, and with jurisdiction from Viele to Carrollton and from Sedan to Elmer, where he succeeds **L. E. Atherton,** who has retired after a service of 50 years with the company.

J. H. Arthur, extra force foreman on the Chesapeake & Ohio, has been promoted to supervisor of track, with headquarters at Covington, Ky., succeeding **Michael Regan,** deceased. Mr. Arthur entered railway service on the Chesapeake & Ohio as a section laborer on October 1, 1891, and continued in this capacity until February 2, 1896, when he was promoted to section foreman. On January 1, 1916, he was promoted to extra force foreman and subsequently served as extra force foreman and supervising foreman at various points up to the time of his promotion to supervisor of track as noted above.

A. Thomson, whose promotion to roadmaster on the Union Pacific at Caliente, Nev., was mentioned in the September issue, was born at Grand Junction, Colo., on July 3, 1887, and entered railway service on September 1, 1903, as a section laborer on the Union Pacific. He served in this capacity until May 1, 1904, and from then until January 1, 1905, was employed on a steam shovel. He was made section foreman on February 1, 1905, and on March 31, 1912, was appointed an extra gang foreman, which position he held until December 31, 1912, when he was made yard foreman. On August 1, 1915, he was promoted to assistant roadmaster, which position he held until his promotion to roadmaster.

J. F. Gallagher, whose promotion to roadmaster on the Suisun district of the Southern Pacific, with headquarters at Suisun, Cal., was reported in the October issue, was born on June 24, 1876, in Ireland. He entered railway service in May, 1893, and from that date until May, 1895, served as a laborer and foreman on the Suisun district of the Southern Pacific. From June, 1895, until January, 1901, he served as extra gang foreman and assistant roadmaster on the Sacramento division. In February, 1901, he was promoted to steel gang foreman, which position he held until July, 1907, when he became yard foreman at Oakland, Cal., which position he was holding at the time of his recent promotion to roadmaster.

E. Bennetsen, assistant roadmaster on the Nebraska division of the Union Pacific, has been promoted to roadmaster, with headquarters at Columbus, Neb. Mr. Bennetsen entered railway service as a section laborer on the Union Pacific in 1906, becoming a section foreman in 1907, continued in this capacity until 1908, when he was appointed an extra gang foreman. He served as an extra gang foreman until 1918, when he was reappointed a section foreman on the Nebraska division. He was promoted to assistant roadmaster of the Omaha terminals of the Nebraska division on September 1, 1923, and was serving in this capacity at the time of his promotion to roadmaster.

Thomas Olds, whose promotion to roadmaster of the Fifth district of the Spokane division of the Great Northern, with headquarters at Marcus, Wash., was announced in the October issue, was born on July 22, 1884, at Beaumont, Kan. He entered railway service as a laborer on the Great Northern on November 1, 1911, and was promoted to section foreman on February 19, 1912, with headquarters at Republic, Wash. He was transferred to Boyds, Wash., on August 10, 1912, where he remained 10 years, with the exception of the summer of 1916, when he served as extra gang foreman. He was transferred to Deer Park, Wash., on January 22, 1922, and on September 15, 1924, was promoted to district roadmaster.

A. C. Haines, whose promotion to supervisor of the C., L. & N. branch of the Cincinnati division of the Pennsylvania System, Southwestern region, was reported in the September issue, was born on September 5, 1882, at Waynesville, Ohio. He entered railway service on April 1, 1904, as a trackman on the Pennsylvania, and on November 1, 1904, was promoted to track foreman. On April 1, 1913, he was made extra gang foreman and on October 15, 1923, was promoted to acting assistant supervisor of Sub-Division No. 1. He held this position until December 16, 1923, when he was again appointed track foreman, holding this position until March 1, 1924, when he became extra gang foreman on the C., L. & N. branch, which position he was holding at the time of his recent promotion to supervisor.

J. A. Cherwinker has been promoted to roadmaster of the Iowa division, branch lines, of the Chicago, Milwaukee & St. Paul, with headquarters at Monticello, Iowa, to succeed **E. G. Drury,** who has been appointed assistant roadmaster. **John Whalen** has been promoted to roadmaster on the west end of the Madison division, with headquarters at Prairie du Chien, Iowa, to succeed **W. Hickey,** who has been assigned to other duties, and **F. B. Moberly** has been promoted to the newly created position of roadmaster on the Terre Haute division, with headquarters at Terre Haute, Ind., pursuant to the increase in roadmasters on this division.

Mr. Cherwinker, who has been promoted to roadmaster on the Chicago, Milwaukee & St. Paul at Monticello, Iowa, was born at Chamberlain, N. D., on June 26, 1889, and entered railway service as a section laborer on the Chicago, Milwaukee & St. Paul on October 13, 1903. He was promoted to assistant extra gang foreman on April 11, 1909, and to extra gang foreman on June 30, 1909, and from that date served consecutively as section foreman and extra gang foreman on rail laying and surfacing gangs over the Kansas City and Chicago terminal divisions and on double track work on the Terre Haute division, until his recent promotion to roadmaster.

E. L. Smith, assistant supervisor of track on the Pennsylvania, with headquarters at Chester, Pa., has been promoted to supervisor of track with headquarters at Millersburg, Pa., succeeding **E. R. Parke,** promoted to assistant passenger trainmaster, as noted elsewhere. **E. L. McNeal,** rodman, has been promoted to assistant supervisor at Parkton, Md., succeeding **William Chauvenet,** who has been transferred to Jamesburg, N. J., to succeed **H. F. Bamberger,** who has been

transferred to Chester, where he has succeeded Mr. Smith.

Mr. Smith, noted above, was born at Millersburg, on July 13, 1890, and was graduated from the University of Pennsylvania in 1912, entering railway service on June 24 of the same year as a chainman in the construction department of the Pennsylvania at Altoona, Pa. After subsequently serving as chainman, rodman and transitman at various points on the system, he was promoted on May 21, 1917, to assistant supervisor of track at Columbia, Pa. He was subsequently transferred on October 28, 1918, to Johnstown, Pa., on June 1, 1919, to Tyrone, Pa., and on May 1, 1920, to Chester, Pa., where he remained until his recent promotion as noted above.

Bridge and Building

W. J. Dunaway, bridge and building foreman on the Mobile division of the Southern, lines west, has been promoted to supervisor of bridges and buildings to succeed **C. L. Rhodes**, deceased.

W. G. Gibson, foreman of the maintenance of way repair shop of the Colorado division of the Union Pacific, has been promoted to assistant supervisor of bridges and buildings of this division, with headquarters at Denver, Colo.

G. A. Manthey, assistant superintendent of bridges and buildings on the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Marquette, Mich., has been retired on pension and has been succeeded by **N. Cadarette**, heretofore division engineer.

Obituary

Robert H. Reid, supervisor of bridges of the New York Central, with headquarters at Cleveland, Ohio, died at his home in that city on October 15, at the age of 59.

P. Madden, a member of the Reclamation committee of the Chicago, Milwaukee & St. Paul, and prior thereto a veteran roadmaster on the La Crosse division, died suddenly on October 13 while on a train going to Chicago.

Michael Regan, supervisor of track on the Chesapeake & Ohio, with headquarters at Covington, Ky., died during September as a result of injuries received in a railway motor car accident. Mr. Regan was born in Ireland on May 29, 1869, and after emigrating to this country, entered railway service as a section laborer on the Chesapeake & Ohio on April 22, 1889, and was promoted to section foreman in 1893.

A. T. Humbert, master carpenter on the Akron division of the Baltimore & Ohio, died on October 2 at Youngstown, Ohio, following the derailment of a motor car on which he was riding on October 1. Mr. Humbert was born on February 2, 1865, and entered the service of the Baltimore & Ohio as a carpenter at Connellsville, Pa., on August 1, 1887. He was transferred to Glenwood, Pa., on August 1, 1888, and on December 1, 1901, was promoted to carpenter foreman, with the same headquarters. He was promoted to master carpenter of the New Castle division (now a part of the Akron division), with headquarters at New Castle, Pa., on September 14, 1915.

A. W. Johnston, formerly assistant to the president and general manager of the New York, Chicago & St. Louis, died in Cleveland, Ohio, on September 8. He was born on March 4, 1853, at Boston, Mass., and received his education at the Massachusetts Institute of Technology. He entered railway service in July, 1875, as a clerk in the general superintendent's office of the Pittsburgh, Cincinnati & St. Louis, and served as a clerk and as a draftsman on that road until December, 1878, when he became assistant engineer. On January 1, 1882, he became chief engineer of the Toledo, Delphos & Burlington, in which capacity he served until April, 1882, when he became superintendent of the Leavenworth, Topeka & Southwestern. He entered the service of the New York, Chicago & St. Louis in April, 1884, as a division engineer and in January, 1889, was promoted to superintendent of the Eastern division. Thereafter he served successively as general superintendent and as general manager and assistant to the president, until his retirement about three years ago. He was president of the American Railway Engineering Association in 1907.

Construction News

The American Railway Express Company plans the construction of a one-story, 24 ft. by 125-ft., mill construction freight station at Hazard, Ky., to cost $25,000.

The Atchison, Topeka & Santa Fe has awarded a contract to the Parr Construction Company, Amarillo, Tex., for the construction of a freight and passenger station at Canyon, Tex., reported in the October issue. The station will be of reinforced concrete with stucco exterior and brick trim in the Spanish mission style, and will be 198 ft. long and 52 ft. wide. The total cost is estimated at $65,000. This company has completed plans for the remodeling and construction of additions to its passenger station in the city of Emporia, Kansas.

The Baltimore & Ohio has awarded a contract to Heyl & Patterson, Inc., New York and Pittsburgh, for a traveling ore bridge to be erected at Lorain, Ohio, to replace one wrecked in the recent tornado.

This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a freight house at Sandusky, Ohio. A contract has also been awarded to Joseph E. Nelson & Sons for the installation of water supply facilities at Ottawa, Ohio, to cost approximately $45,000, as reported in the September issue.

The Canadian Pacific is completing surveys for a proposed extension of the Edmonton, Dunvegen & British Columbia to a point near Prince George, B. C. This company has called for bids for the construction of a concrete and steel subway at 101st street, Edmonton, Alta. The subway will be 190 ft. long, 76 ft. wide with 380-ft. depressed approaches and will have a substructure for eight tracks and a superstructure for six tracks.

The Chesapeake & Ohio has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a new station and baggage room at Ashland, Ky., to cost approximately $500,000. This work is part of a general improvement program at Ashland involving a total expenditure of $2,500,000. The new station will be a three-story brick building, with Bedford limestone trimming. The main portion of the structure will be 168 ft. long by 52 ft. wide, and the baggage room, which will form an adjoining wing, will be 46 ft. by 47 ft. wide, making the total length 214 ft. by about 50 ft. Three train platforms, each 1,000 ft. long, will be provided, accessible only through subways. The work will be completed in about a year.

The Chicago & North Western has awarded a contract to Peppard & Burrill, Minneapolis, Minn., for the construction of an ore dock at Escanaba, Mich., to cost approximately $2,500,000.

This company has awarded a contract to Henry Danischefsky, Milwaukee, Wis., for the construction of a passenger station at Waukegan, Ill.

The Chicago, Rock Island & Pacific has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a coach shop at Shawnee, Okla., to cost approximately $200,000.

The Cleveland, Cincinnati, Chicago & St. Louis will soon authorize the construction of grade separation at Dennison avenue, Columbus, Ohio, to cost $300,000; six miles of second track near Quincy, Ohio, to cost $350,000; automatic train control from Indianapolis, Ind., to Hadley, a distance of 20 miles, to cost $250,000; enginehouse extension at Kankakee, Ill., to cost $230,000; a freighthouse at Galion, Ohio, to cost $60,000; and a freighthouse at Bellefontaine, Ohio, to cost $40,000. A turntable to cost $50,000 will be installed at the enginehouse at Mt. Carmel, Ill., and a single track truss span bridge will be constructed at Lawrenceville, Ill., at a cost of $36,000.

The Colorado River Land Company has secured concessions for the construction of a railroad from Calexico, California, to San Felipe Bay, Lower California, a distance of 135 miles. The proposed line will run west from Calexico to Labomba on the coast, then southward parallel to the coast line to San Felipe. J. C. Allison, Calexico, is engineer of the land company.

The Denver & Rio Grande Western, jointly with the Colorado & Southern, plans the construction of a union passenger station at Walsenburg, Colo., to cost approximately $30,000.

The Detroit, Toledo & Ironton plans the construction of a roundhouse and repair shop and a large yard at Lima, Ohio.

The Erie has awarded a contract to Acken-Shapiro, Inc., New York, for the construction of a station at Englewood, N. J., to cost approximately $65,000. A contract for the construction of a chimney at the company's new powerhouse at Jersey City, N. J., has been awarded to the Alphons Custodis Chimney Construction Company, New York. A contract for coal pulverizing equipment for the same powerhouse has been awarded to the Economy Equipment Company and for coal handling equipment to the Beaumont Machinery Company. Work has been started on a small engine terminal at South Paterson, N. J., in connection with the grade crossing elimination work which is being undertaken there.

The Florida East Coast has authorized the construction of second track from Lemon City, Fla., to Buena Vista, to cost approximately $105,000, and for second track, with yard changes, through West Palm Beach, Fla., to cost approximately $303,000.

The Great Northern has awarded a contract to the Barnett & Record Company, Duluth, Minn., for the construction of the reinforced concrete and pile foundation for an ore dock, 724 ft. long and 200 ft. wide, at Superior, Wis., to replace a wooden dock which is to be dismantled.

The Gulf Coast Lines has authorized the construction of a 32-mile extension of the San Benito & Rio Grande Valley from Santa Maria, Tex., to Sammons, at a cost of $500,000. This company has also authorized the construction of a 29-mile extension of the St. Louis, Brownsville & Mexico from a point between Lyford, Tex., and Raymondville on the main line to Edinburg, Tex., the present end of the Edinburg branch, at a cost of $450,000.

The Illinois Central has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of a 600-ton coaling station at Dawson Springs, Ky., reported in the October issue.

This company has called for bids for the construction of a freight station at Harvey, Ill.

This company has closed bids for the construction of a cut-off from Edgewood, Ill., to Fulton, Ky., a distance of 169 miles. This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a scale pit at Markham yard, Chicago.

The Minneapolis, St. Paul & Sault Ste Marie plans the construction of an engine terminal, including a five-stall roundhouse and repair shop at Park Falls, Wis. The construction of a passing track with a capacity of 80 cars is also planned.

The Mississippi-Alabama Central, recently organized, has been authorized by the Mississippi Railroad Commission to construct a railroad from Tremont, Miss., to Sulligent, Ala., a distance of 25 miles. M. D. L. Spearman, Tremont, Miss., is one of the promoters of the project.

The Missouri-Kansas-Texas will soon call for bids for the construction of a subway at Walnut street, Nevada, Mo., the cost of which is to be shared jointly with the city of Nevada. This company has awarded a contract to T. H. Johnson for the construction of two reinforced concrete trestles 207 ft. and 442 ft. long, respectively, at St. Paul, Kan., to cost $42,000.

The Missouri Pacific has awarded a contract to H. O. Hirsch & Company, St. Louis, Mo., for the construction of a 30-ft. addition to its passenger station at Newport, Ark.

The Northern Pacific has applied to the Interstate Commerce Commission for authority to construct an extension of 15 miles in Mason county, Wash., including 8 miles of logging road to be acquired.

The Los Angeles & Salt Lake has been granted authority by the Railroad Commission of California to proceed with the construction of a new line to Los Angeles Harbor.

The Oklahoma-Southwestern is making preliminary surveys for the construction of an extension from Nuyaka, Okla., to Okemah, a distance of 18½ miles.

The Pacific Fruit Express will soon call for bids for the construction of refrigerator car repair shops at Nampa, Idaho, reported in the August issue.

The Pennsylvania has awarded a contract to the Dravo Contracting Company, Pittsburgh, Pa., for masonry work for a new bridge over the Ohio river at Steubenville, O., to cost approximately $500,000. A contract has been awarded to the Eyre-Johnston Company, Philadelphia, for the construction of an overhead bridge to eliminate a grade crossing at Slickville, Pa., to cost approximately $50,000. A contract has been awarded to the John F. Casey Company, Pittsburgh, for the reconstruction of an undergrade bridge at Hunker Station, Pa., to cost $20,000.

This company has awarded a contract to the Brown-King Construction Company, Philadelphia, for the construction of a bridge at Second street, Philadelphia, to cost approximately $100,000. The city will share in the expense.

The Rio Grande City & Northern has been denied its application for authority to construct a line from Samfordyce to Mirando City, Tex., 85 miles. The commission recently authorized the Rio Grande City to build a line from Samfordyce to Rio Grande City.

The Rutland has under construction a 750 hp. central boiler plant at Rutland, Vermont, estimated to cost $156,000. The building contractor is Henry R. Kent & Company, Rutherford, N. J.; boiler contractor, E. Keeler Company, Williamsport, Pa.; piping contractor, John W. Danforth Company, Buffalo, N. Y. A contract for a 150-ft. radial brick chimney has been awarded to the American Chimney Corporation, New York. The balance of work is being done by company forces. The company has under way an extension of five stalls to its enginehouse at Rutland. The new length of stalls will be 100 ft. The estimated cost is $52,000. The building contractor is the C. A. Dodge Company, Cambridge, Mass. The balance of the work is being done by company forces.

This company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the installation of an electric cinder conveyor at Malone, N. Y.

The Southern Pacific has called for bids for the construction of nine miles of a partly completed belt line east of Dallas, Tex. The cost of project, which will include the elimination of all grade crossings, will be approximately $600,000.

This company plans the immediate construction at Houston, Tex., of a ship and rail terminal to cost $1,061,000. The plans include a slip 830 ft. long and 225 ft. wide with a concrete water front apron 25 ft. wide. The slip will contain three track bays with four tracks in each bay. A loading transfer shed, 70 ft. by 820 ft., and an unloading transfer shed, 70 ft. by 400 ft., will be constructed. A 60-ft. by 400-ft. warehouse is also planned. An oil-unloading wharf and facilities for handling steel with an 80-car capacity track will be constructed adjacent to the pier. The buildings will have steel frames covered with asbestos-protected metal and will be equipped with electric elevating conveyors.

The Union Pacific contemplates the construction of a one-story power plant at Huntington, Ore., to cost approximately $25,000.

This company has awarded a contract for the construction of a wharf 1,072 ft. long, with a covered enclosure 903 ft. long, at Portland, Ore., at a cost of $370,000. This company has also awarded a contract for the construction of a steel coaling station with overhead storage capacity of 150 tons, at Valley, Nebr., to cost $70,000 and will erect with company forces a 200,000-gal. steel water tank at Valley at a cost of $25,000. A two-story rustic stone and frame pavilion 130 ft. by 41 ft. and 18 small cabins at Bryce Canyon, Utah, and another two-story pavilion 92 ft. by 44 ft., with 21 cabins at Zion National Park, Utah, will be constructed by company forces. Each of these projects will cost $60,000.

The Western Maryland has awarded a contract to the T. J. Foley Company, Pittsburgh, Pa., for the rebuilding of an engine house at Bowest, Pa., which was damaged by fire; estimated cost, $35,000. A bridge over a state highway at Nort Branck, near Cumberland, Md., will be built by the Vang Construction Company, Cumberland, at an approximate cost of $45,000.

Supply Trade News

Personal

The Whiting Corporation, Harvey, Ill., has moved its Detroit office from 300 Grand River avenue to 650 Baltimore avenue, west.

The Long Bell Lumber Company, Longview, Wash., has awarded a contract to C. A. Mitchell, Ryderwood, Wash., for a one-story machine shop 90 ft. by 156 ft. at its plant in the vicinity of Ryderwood.

The Conveyors Corporation of America, Chicago, has appointed the **W. P. MacKenzie Company,** 1234 Callohill street, Philadelphia, Pa., as its sales representative in southeastern Pennsylvania and southern New Jersey.

The McMyler-Interstate Company, Bedford, Ohio, has acquired the railroad turntable department of the King Bridge Company. Patterns, drawing, sales records and other material and records taken over from the King Bridge Company will be maintained by the McMyler-Interstate Company.

The Chausse Oil Burner Company, Elkhart, Ind., has appointed **E. R. Mason,** Grand Central Terminal building, New York, **The Direct Sales Company,** Manhattan building, Chicago, and the **Railroad Signal Supply Company,** Hackney building, St. Paul Minn., sales representatives for the sale of kerosene torches and switch heaters.

This company, a manufacturer of kerosene torches, railway switch heaters, etc., and the **White Manufacturing Company,** a manufacturer of pins and bushings, have moved into a new factory at Elkhart, Ind.

Condron & Post, a firm of consulting and designing engineers, 53 W. Jackson boulevard, Chicago, has been formed by **Theodore L. Condron** and **Chester L. Post,** to continue the engineering practice carried on by them under the name of the Condron Company since 1912 and by Mr. Condron since 1901. Attention will be given to consultation and advice with other engineers, architects and investors regarding preliminary or advance plans for steel or reinforced concrete buildings and other structures, and also to investigations, reports and testimony in connection with improvements, arbitrations and litigation.

The American Bolt Corporation has approved plans for the erection of a new Chicago warehouse and shop on the south side of west 47th street near South Turner avenue, in the Kedzie development of the central manufacturing district of Chicago. Th land with improvements will represent an investment of about $230,000. The building will be two stories high with 64,134 sq. ft. of floor space. The American Bolt Corporation is a consolidation of four bolt manufacturers with works at Bayonne, N. J., Columbus, Ohio, Detroit, Mich., and Chicago. The Chicago plant was formerly operated by the Boss Nut Company, one of the members of the consolidation.

General

E. H. Weitzel has been promoted to manager of the Minnequa plant of the **Colorado Fuel & Iron Company,** Denver, Colo., to succeed **F. E. Parks,** who will serve that company in a consulting capacity.

John W. Meaker, manager of the fence and post sales department of the **American Steel & Wire Company,** with headquarters at Chicago, has been appointed general manager of the **Cyclone Fence Company,** with headquarters at Waukegan, Ill., following the purchase of this company, including the plants at Fort Worth, Tex., Newark, N. J., and Cleveland, Ohio, by the **United States Steel Corporation,** and the retirement of **J. P. Arthur** and other officers. Mr. Meaker will be succeeded by **H. A. Squibbs,** assistant manager of the fence and post sales department.

F. R. Hopper, western manager of the **Concrete Steel Company,** with headquarters at Chicago, has been transferred to Kansas City, Mo., as district manager, where he will be in charge of the company's business in Nebraska, Kansas, Oklahoma, western Iowa and western Missouri. **C. A. Lord,** district manager at Kansas City, has been transferred to Chicago. The position of western manager has been abolished and the Chicago, St. Paul and Kansas City district sales offices will report direct to the general office in New York. The Omaha branch office will report to the Kansas City district sales office.

L. G. Pritz, vice president of the **Sizer Steel Corporation,** Buffalo, N. Y., has been appointed vice president in charge of all operations of the **United Alloy Steel Corporation,** Canton, Ohio. In 1909 he entered the employ of the Illinois Steel Company at South Chicago, Ill., where he served as foreman melter, superintendent of electric furnaces and suprintendent of high special grade steels, and metallurgical engineer in charge of the specialty and alloy steel department. In 1917 he entered the employ of the Timken Roller Bearing Company and in 1922 resigned as general superintndent of the steel works in charge of electric furnaces, rolling mills and two plants in production of bearing steels to become vice president of the Sizer Steel Corporation, which position he has held until his recent appointment.

Trade Publications

Zinc.—The New Jersey Zinc Company, 160 Front street, New York, has issued a new booklet on the use of zinc for roofings. This circular shows the method of applying the roofing and furnishes other information regarding the range of use and the service results obtained with this material.

Gaskets—A 20 page booklet has been issued by the McCord Radiator Manufacturing Company, Detroit, Mich., describing and cataloging the McKim line of gaskets for high and low pressure pipe lines, boilers, engines, valves and other installations where gaskets of copper, aluminum, tin, zinc, steel or other metallic composition or asbestos are required. The catalog includes a price list of gaskets, as well as dimensions.

Cinder Conveyors.—The Conveyors Corporation of America, a manufacturer of coal and ash handling equipment, 326 West Madison street, Chicago, has issued a new booklet describing its steam jet cinder conveying equipment. The description is chiefly devoted to the use of this equipment at terminal cinder pits and includes photographs and drawings to show both the manner of installation and operation. Reference is also made to experience had with the equipment described.

Metal Coating Equipment.—The Metals Coating Company of America, Philadelphia, Pa., has recently issued a large-sized, 16-page, illustrated booklet on the spraying or metal coating equipment manufactured by this company. The booklet describes in detail the Schoop process of coating iron and steel with lead, copper, zinc and other commercial metals as a protection against corrosion and other destructive influences. The construction and operation of the two classes of equipment for use when wire and metal dust are used, are shown by both text and illustrations.

Pneumatic Tools.—The Independent Pneumatic Tool Company, 600 West Jackson boulevard, Chicago, has issued its catalog No. 13 which is a compilation of 190 pages comprising a complete list of its pneumatic tools and repair parts with detailed instructions for the ordering and maintenance of the equipment when in use. This catalog supersedes all other repair parts catalogs except the list on Thor drills. The lists of all equipment are supplemented by diagrammatic views of the different tools as a means of simplifying the problem of identifying parts.

Air Tools and Compressors.—An unusually interesting booklet has been issued by the Ingersoll-Rand Company, 11 Broadway, New York, under the title of "101 Ways to Save Money with Portable Air Power." As the name implies, this booklet, which comprises 72 pages, lists the large number of applications of compressed air equipment, in connection with which it furnishes descriptions of actual projects on which the tools are used, together with clear cut illustrations and information as to the methods of use and results obtained. Considerable attention is devoted to the description of the various kinds of railroad work in which this equipment is now being used, the illustrations showing its use in breaking pavement, rail bonding, rail bolting, tie boring, paint spraying, tie tamping, cleaning bridges, etc.

KALAMAZOO

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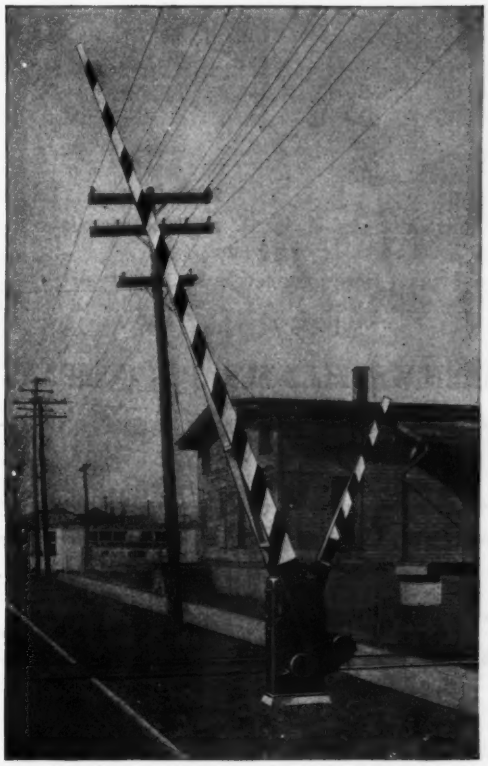

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Railroads which have installed these superb air dump cars are enthusiastic. May we refer you to them? Write today for additional information.

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FOUNDED 1877
Earth and Stone Handling Equipment
AURORA, ILLINOIS

MURDOCK
WATER SERVICE

MADE FOR ANY DEPTH OF BURY
INSULATING AIR SPACE
EARTH DOES NOT COME IN CONTACT WITH WATER SUPPLY TUBE
SUPPLY INLET
GROUND DRAIN ATTACHMENT IF FOR SEWER DRAIN, UNSCREW AND DISCARD THIS PIECE
SURFACE DRAIN

Water Service Box
for
CINDER PITS
COACH YARDS
TRAIN SHEDS
ROUND HOUSES

12 Types
Sizes ¾ inch to 2 inch

ALSO

Heavy Duty Drinking Fountains
FOR INDOOR SERVICE

AND

Anti-Freezing Bubble Font
FOR OUTDOORS

Type "D" 1¼" size
Type "E" 1½" size
Type "O" 2" size

Write for complete catalogue.

The MURDOCK MFG. & SUPPLY Co.
"THE ORIGINAL HYDRANT HOUSE"
CINCINNATI, OHIO.

Makers of Outdoor Water Devices Since 1853

Kilby Frog & Switch Co.

Birmingham, Ala.

Manufacturers of

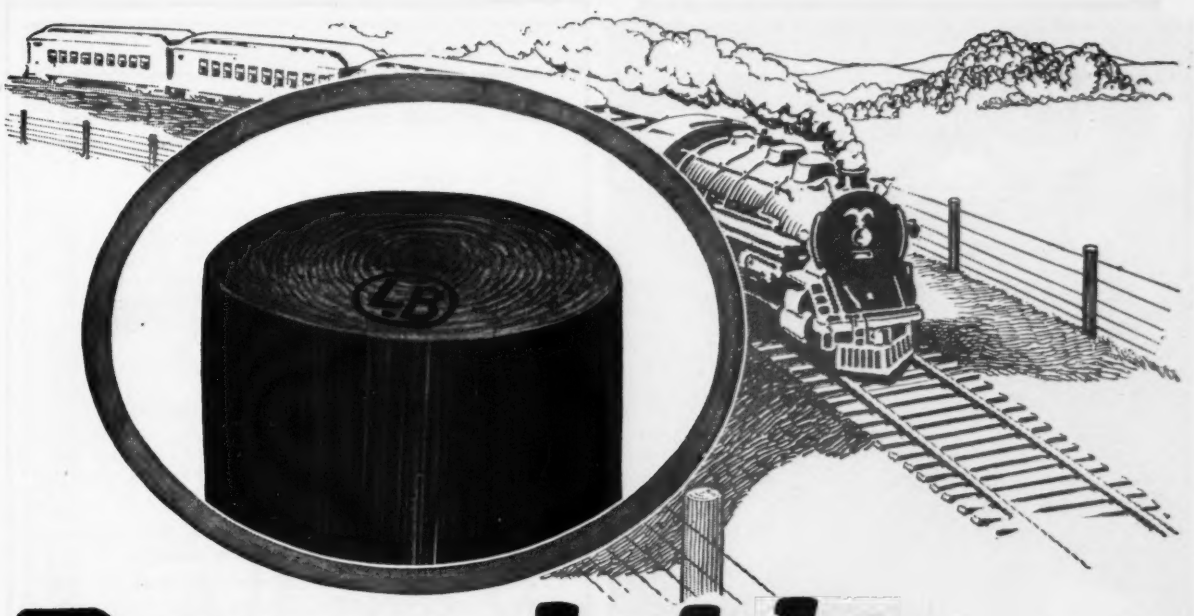
Railroad Crossings, Frogs and Switches

Manganese Track Work a Specialty

Balkwill Cast Manganese Articulated Crossings

Graham Flange Frogs

(The Savers of Maintenance)



Dependable Right-of-way Fences!

WHERE Long-Bell Creosoted Yellow Pine Posts are used, railroad right-of-ways are dependably protected and maintenance costs are materially reduced. These sturdy posts resist grass fires. They hold wires firm and taut. Smooth, straight and trim looking, they add to the appearance of the right-of-way. Each post is branded with the L-B trademark to identify its quality.

Long-Bell Creosoted Posts are treated, full length, with coal tar Creosote by the pressure-vacuum process. This is the secret of their long life—their ability to resist decay, fire and other elements that destroy untreated posts. Economical because they seldom need replacing. Good fences reduce stock claims.

Further information about these posts that reduce maintenance labor and expense will be promptly sent on request.

The Long-Bell Lumber Company
814 R. A. LONG BLDG. KANSAS CITY, MO.

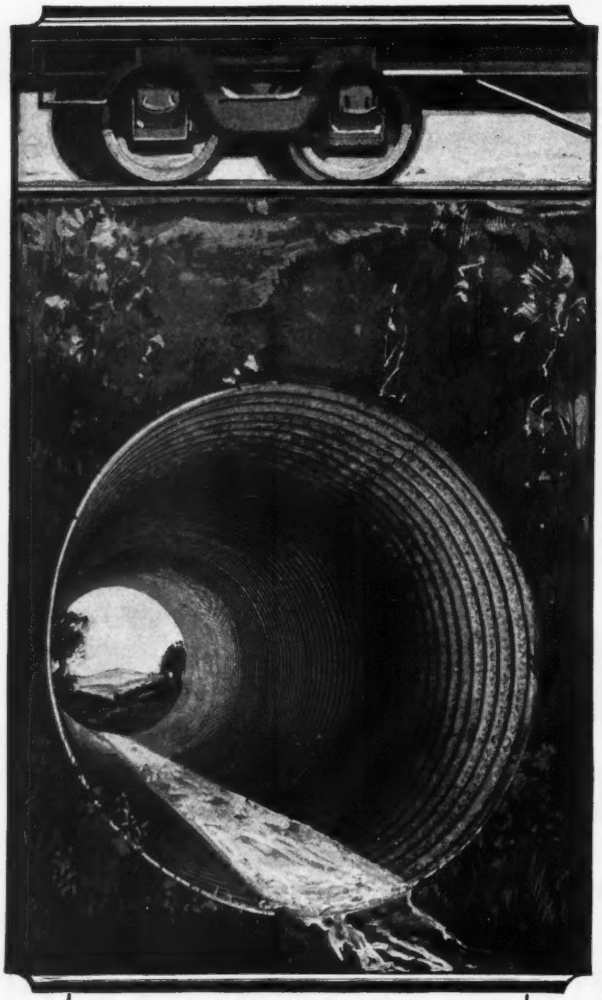
Facts and Figures

Figures compiled by a large western railroad having 2,000,000 fence posts along its right-of-way (400,000 treated and 1,600,000 untreated) demonstrate how *treated* posts resist fire. In 1920, during the right-of-way burning, 2,212 posts were destroyed—*only 12 of that number being treated posts.* During 1921, a total of 3,349 of the company's fence posts were destroyed by fire—3,295 being untreated and *54 treated.*

The satisfactory service given by Creosoted Posts has resulted in their adoption as standard equipment by the M. K. & T., Kansas City Southern and other railroads.

LONG-BELL

CREOSOTED *Yellow Pine Fence Posts*



Hand Dipped

AFTER FORMING

The greatest culvert improvement in years is the Wheeling Hand Dipped Metal Culvert. A uniform heavy coating of pure zinc protects the inside and outside surfaces, also the edges of the culvert, and because forming operations take place before the culvert is coated, there are no coating fractures where rust can get a start. As further protection to the life of the Wheeling Hand Dipped Culvert, Copper-Bearing Steel is used as the base metal. Write for prices.

Wheeling Corrugating Company

Wheeling, West Virginia

New York Kansas City Chicago Chattanooga
Philadelphia Richmond St. Louis Minneapolis

Wheeling
HAND DIPPED
Corrugated
Culvert

STATEMENT of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of *Railway Engineering and Maintenance,* published monthly at Chicago, Ill., for October 1, 1924.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared E. A. Simmons, who, having been duly sworn according to law, deposes and says that he is the President of the Simmons-Boardman Publishing Company, publishers of *Railway Engineering and Maintenance,* and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Simmons-Boardman Publishing Co., 608 South Dearborn St., Chicago, Ill.

Editor, Elmer T. Howson, 608 South Dearborn St., Chicago, Ill.

Managing Editor, Walter S. Lacher, 608 South Dearborn St., Chicago, Ill.

Business Manager, F. C. Koch, 30 Church St., New York, N. Y.

2. That the owners are:

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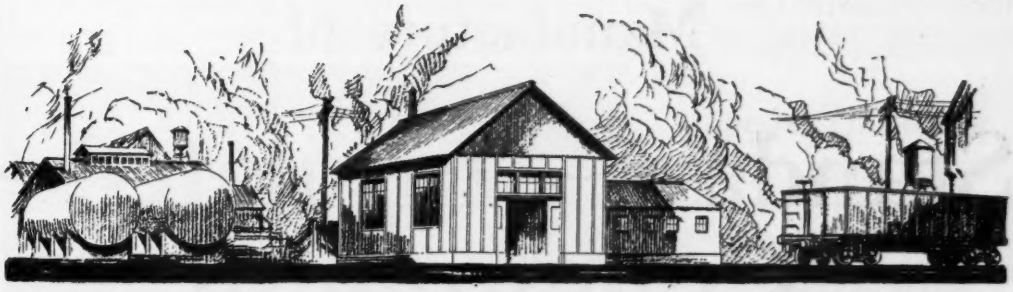
E. A. SIMMONS.

[SEAL]

Sworn to and subscribed before me this 30th day of September, 1924.

HENRY D. NELSON.
(My commission expires March 30, 1925.)



Steel That's Durable All the Way Through

An Economical Rust-Resistant Steel for Roofing, Siding, Tanks, Freight Cars and many other uses

ARE repairs and replacements caused by the corrosion of steel constantly increasing your road's maintenance costs? Is this enemy of steel everlastingly gnawing at the profits? There is a solution to this problem.

Something can be done about it. A corrosion resisting steel is now available in sheets, plates and other forms.

This durable metal is Inland Copper Alloy Steel. Many roads are using it. Others will, when they know its good quality and low comparative cost.

Inland Copper Alloy Steel is not mere surface durability, but an alloy that is *durable all the way through.*

We shall appreciate the opportunity of telling you the complete story of Inland Copper Alloy. We shall also be glad to furnish samples for comparative tests. We should like to work with you in reducing your maintenance costs. There is no obligation and we think we can be of real help.

In addition to Copper Alloy Steel, INLAND makes: Rails; Track Accessories; Sheet Steel—Black, Blue Annealed and Galvanized; Special Locomotive Jacket Sheets; Car Shapes; Structural Shapes; Universal Mill Plates; Sheared Plates; Reinforcing Bars; Merchant Bars; Boiler and Structural Rivets; and other products.

INLAND
COPPER ALLOY
QUALITY

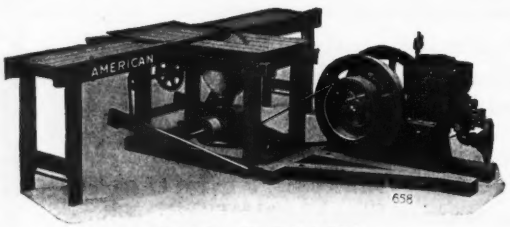
INLAND STEEL COMPANY
38 South Dearborn Street, Chicago
Branch Offices: Milwaukee, St. Paul, St. Louis, Kansas City
Mills at Indiana Harbor, Ind., Chicago Heights, Ill., Milwaukee, Wis.

Specialists in Design and Manufacture of

Standard—Insulated—Compromise Rail Joints

THE RAIL JOINT COMPANY
61 Broadway, New York City

Cutting Construction Costs



SET FOR CUTTING OFF

A handy, Portable Rip and Cut-off Machine—20-inch saw, handles stock up to 6 inches thick and 16 inches wide. Nothing better for hurry-up construction jobs. Furnished with or without power. Ask for Bulletin No. 80 of Portable Woodworking Machinery.

SET FOR RIPPING

American Saw Mill Machinery Co.
164 Main Street Hackettstown, N. J.

PUMPS

A TYPE FOR EVERY SERVICE

Bulletins on request

THE GOULDS MANUFACTURING COMPANY

SENECA FALLS, N. Y.

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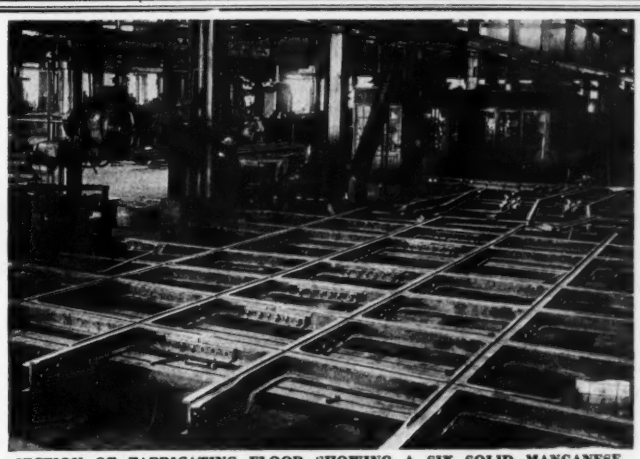

SECTION OF FABRICATING FLOOR SHOWING A SIX SOLID MANGANESE STEEL CROSSING JOB FOR AN EASTERN RAILROAD

Special Trackwork

For Steam and Electric Railroads in all types of construction.

The application of Manganese Steel for trackwork was originated by and developed by this company.

Maintenance Engineers are invited to submit their difficult or unusual problems to us; our facilities for the production of such work are unsurpassed.

WM. WHARTON, JR. & CO., Inc.,
Easton, Pa.

Taylor Wharton Iron & Steel Co.
Plant at High Bridge, N. J.
Manganese Steel Wearing Parts

Wm. Wharton Jr. & Co.
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Special Trackwork Cylinders for Gases

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A User of

McWane Pipe Says—

"It saves the labor of two men in laying."

Our booklet R tells why. Ask for it.

McWane Pipe Costs Less!

Sizes 1¼, 2, 3, 4 and 6 inches.

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McWANE PRECALKED JOINT PIPE CAST IRON

The Blaw-Knox SINGLE LINE Bucket

hook it on

—REPLACE HAND LABOR

When unloading cars of coal, sand, etc.; cleaning up slag, debris—any kind of work.

When you have bucket work to do — throw the yoke of the closing line over the crane hook and go to it.

When through — set the bucket aside and let the crane be on its way.

Send for our new booklet—descriptive of the SINGLE LINE.

BLAW-KNOX COMPANY
639 Farmer's Bank Building
Pittsburgh, Pa.

BLAW-KNOX BUCKETS

"MAKE GOOD OR NO PAY"

WE will furnish our Fire Resisting Paint to cover any wooden bridge or trestle you may select on your line of road.

Your men to apply the paint under the supervision of our representative.

When paint is dry, and we have been notified as to date of test, a locomotive is to be run over the structure as many times as you wish, the fireman shaking the grate to allow the scattering of as much fire as possible.

If this test shows that under these conditions the structure cannot burn, your company is to pay us for the paint used.

Provided, that if you so desire, we first prove by reference to officials on not less than two railroads that the preservative and fire resisting properties of this paint remain effective for at least five years.

We will furnish under this offer any amount of our paint from one barrel to one carload (65 barrels).

Respectfully submitted,

THE CLAPP FIRE RESISTING PAINT CO., Bridgeport, Conn.

The value of the preservative properties of this paint will be found to be far more than your outlay.

The Frog, Switch & Manufacturing Company

Carlisle Pennsylvania

Established 1881

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MANUFACTURERS OF
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SOLID MANGANESE FROGS AND CROSSINGS
PLAIN FROGS, SWITCHES, CROSSINGS
SWITCH STANDS AND ACCESSORIES

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HIGH GRADE MANGANESE STEEL CASTINGS
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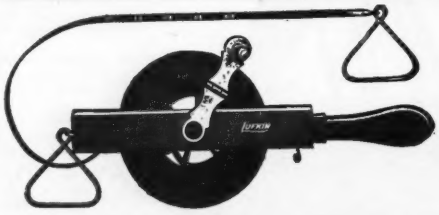
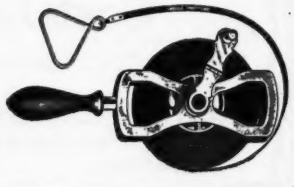
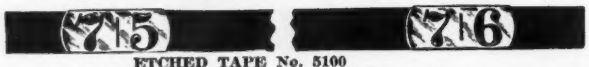
CEMENT MILL, MINING MACHINERY, ETC.
GRAY IRON CASTINGS



LUFKIN CHAIN TAPES





ETCHED TAPE No. 5100
A sturdy tape best for all precise chaining work.
½-gage mark when specified.

BABBITT (Chicago Style) TAPE
Most popular for all rough survey and maintenance work. With ½-gage mark.

ENGINEER'S PATTERN TAPES — WOVEN TAPES OF ALL GRADES

Send for Catalogue

WINDSOR, ONT. LONDON, ENG.

THE LUFKIN RULE CO.

SAGINAW, MICH. NEW YORK

Bethlehem Parallel, Throw Switch Stand, Model 1222 —unusual Safety Features

Bethlehem Parallel Throw Switch Stand, Model 1222, is unusual with its low height, strength and simplicity. It is lower than the rail (only 4¼ in. high from tie to bottom of lamp tip). Low height and parallel throw lever make it particularly desirable for use in confined locations.

Bethlehem Model 1222 is built up of but three moving parts, is easy to throw, boltless, and readily adjustable (range of adjustment, 3½ in. to 6 in.). One Model 1222 installed almost four years ago has been thrown over 600,000 times.

BETHLEHEM STEEL COMPANY, *General Offices* **Bethlehem, Pa.**

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Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Export of Our Commercial Products

BETHLEHEM

ECONOMY

American Lime-Soda Water Softeners treat feed water to prevent scale in locomotives. This means:—

1. Saving in fuel.
2. Saving of cost of labor for cleaning and repairing locomotives.
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Investments in AMERICAN WATER SOFTENER COMPANY LIME-SODA WATER SOFTENERS pay dividends of from 50% to 100%.

Write for Our Literature

AMERICAN WATER SOFTENER CO.
Fairhill P. O. PHILADELPHIA, PENNA.

Specialists for twenty-two years in
Railroad Water Purification

Pounding over the joints

UNDER the impact of rail-ends, track insulation is twisted, warped and bent. Modern rolling stock has created a need for insulation of great durability.

Diamond Fibre Railway Insulation stands every test of hard usage. It is dense, tough, resilient. It does not crystallize under extreme vibration. It prevents current losses.

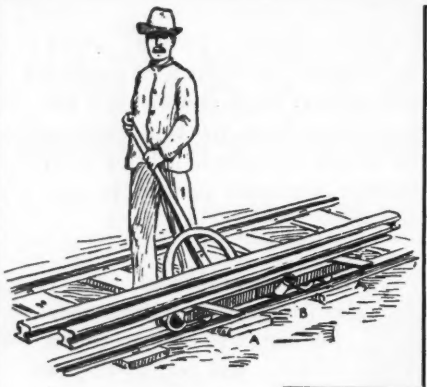
Diamond Fibre Railway Insulation has been adopted by some of the largest railways in the country. The low initial cost and long-wearing qualities have shown this material to be practical and economical.

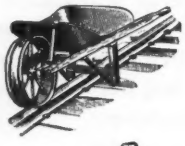
Where unusual mechanical strength is essential, we recommend Celoron (another Diamond State Fibre Co. product) as the ideal material.

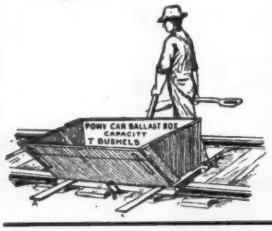
You can prevent costly delays to traffic by making Diamond Fibre and Celoron standard insulation.

Let us send you samples and quotations.

Diamond State Fibre Company
Bridgeport, Pa., and Chicago, Ill.
Branches in Principal Cities Toronto, Canada; London, England







EACH CAR A LABOR SAVER

Pony Car and Skid Set.	Carbarrow.
American Trackbarrow.	Dandy Car.
Pony Car Skid Set Ballast Box.	Pony Car without Skid Set.

American Trackbarrow one-rail maintenance cars are economical, durable and useful. Easy to handle, safe and great labor savers. All of which make work a pleasure. Cheerful men do more and better work.

THE AMERICAN TRACKBARROW, Box 445, Lowell, Mass.

A Bull's Eye or Shrapnel

Shrapnel scatters—it may or it may not take effect—a bull's eye is a direct hit and the effect is complete and instantaneous.

HOW ABOUT YOUR ADVERTISING?

Railway Engineering and Maintenance received this comment unsolicited from a Railroad President

"Your editorials are directed at the target at which we must all aim and each one scores a bull's eye."

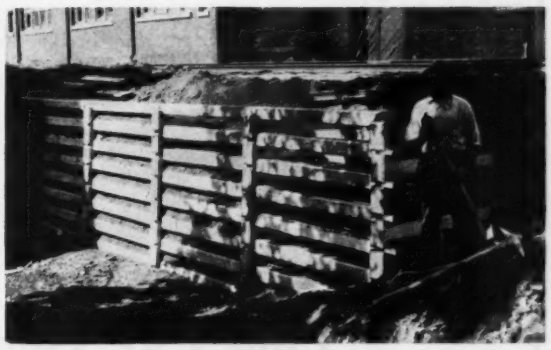
Quite reasonable to conclude, is it not, that the advertising pages directed at the same target are scoring just as many direct hits?

We sell derailing service; we make it our business to help you get good results from every Hayes Derail you have all the time it is in track. There is a Hayes Derail for every need. The sliding type with three point bearing called Model H is in most demand and is the best all around derail. It is for operation by pipe line, by switch stand or direct by hand. Hayes Derails are in wide use on nearly every railroad in North America.

Hayes Track Appliance Co., Richmond, Indiana

Concrete Cribbing Requires Less Excavation Than a Solid Wall

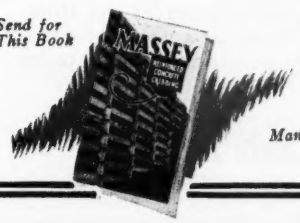
IN building a concrete cribbing wall you don't have to throw out the excavated material and then back fill it after the wall is completed as in the case of a solid wall. You handle the material only once. When one crib is completed the material excavated for the next section can be thrown into it as back fill. This labor saving is worth having on your next retaining wall job.



MASSEY CONCRETE PRODUCTS CORPORATION

Peoples Gas Building, CHICAGO

Send for This Book



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ST. LOUIS
Railway Exchange

ATLANTA
Candler Building

PITTSBURGH
Oliver Bldg.

LOS ANGELES
352 Pacific
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SAN FRANCISCO
1101 Matson Bldg.

Manufacturers of Concrete Culvert Pipe, Piling and Other Concrete Products for Railroad Use.

5
Points in Favor of Concrete Cribbing

1. LOW COST. Considerably less than a monolithic retaining wall.
2. MINIMUM EXCAVATION. Material excavated for each section can be used as back fill for the adjacent section.
3. NO EQUIPMENT NECESSARY. Units can be easily handled by two men.
4. 100% SALVAGE VALUE. Equally applicable for temporary or permanent work.
5. NO EXPOSED METAL or dowels to break off and start corrosion.

How many of your water columns are knocked down every year?

What does the repairs and maintenance—not the result of ordinary use—cost you?

Avoid this annoyance, trouble and expense by using a

How lateral movement of spout prevents column being knocked down

The open telescopic joint does not waste a drop of water. It banishes the usual winter time troubles. Ice does not collect upon it.

The valve permits the maximum amount of water to flow in the shortest time. There is a minimum or frictional resistance. It shuts the water off quick without water hammer.

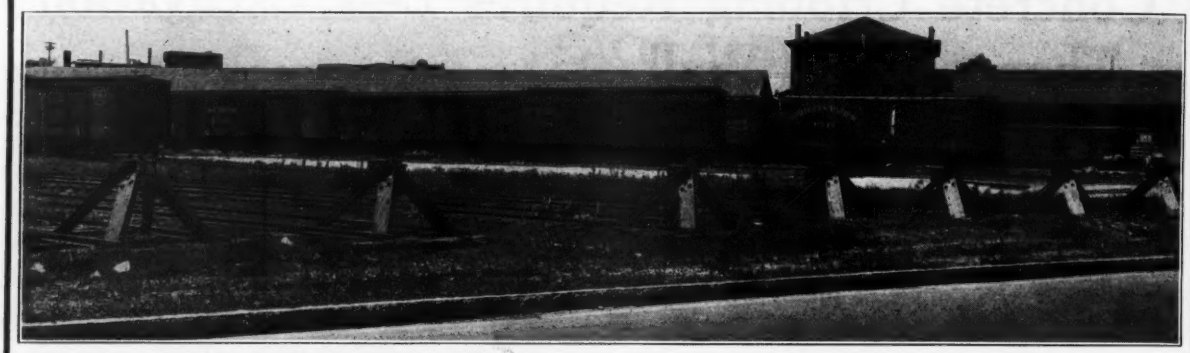
Try the Poage Style H column. You will find that it has remarkable operating advantages.

POAGE Style "H" *WATER COLUMN with* FENNER DROP SPOUT

The three foot lateral range in the Fenner spout and the steel riser in the Poage Style H save the water column from being knocked down by the shifting of the tender.
The tender has to leave the track to knock this column down.
The flexible spout makes it unnecessary to spot the tender accurately.
You save time by quick adjustment.
The five foot up and down range enables the water column to fill a tender of any height.

Manufactured Exclusively By

The American Valve & Meter Co.
Cincinnati, Ohio

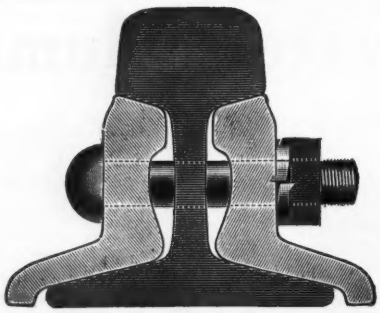


One Car Over the Track End Equals a Thousand on the Track

THE track maintenance occasioned by one car pushed over a track end may be more than equal to that of a thousand cars properly handled into and out of a yard. When the track end is adjacent to a building, the edge of an embankment or a busy boulevard as in the above picture, the cost of an over-running car may be multiplied many times, and may also endanger human life.

The best track end protection available is the only insurance against casualties of this kind. The Durable bumping posts shown in the illustration provide this insurance at a very low rate. Are you overlooking any points that ought to be protected?

MECHANICAL MANUFACTURING COMPANY
Pershing Road and Loomis Street Chicago, Illinois



POSITIVE
LOCK WASHERS
for
Positive Protection

The body of this washer carries the load of compression, thus relieving the tempered ends and keeping the "spring" constant. The barbs are free to move under vibration and force themselves deeply into the nut and seat.

This principle was originated by us. Constant development has made the Positive the most practical and economical washer in use today.

WE ALSO MAKE "PLAIN LOCK WASHERS"

The POSITIVE LOCK WASHER CO.
Miller St. & Ave. A, Newark, N. J.

Headley Number 1

CROSSINGS
and
STATION PLATFORMS

Write for Particulars and Booklets

HEADLEY GOOD ROADS CO.
Franklin Trust Bldg., Philadelphia, Pa.

BRANCH OFFICES:
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Chicago, 409 Monadnock Block Building
West Medford, Mass., 37 Prescott Street
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AMES

SHOVELS SPADES SCOOPS

For 150 years Ames Shovels have been recognized as the standard shovel. Made of the finest steel, thoroughly seasoned ash handles—perfectly fashioned by skilled workmen whose fathers for three generations have worked in the **Ames factories.** Knowledge gained in 150 years of exclusive shovel making gives you in **Ames Shovels** a finished product that is absolutely the finest shovel made.

BUY BY NAME

LOOK FOR THIS LABEL

1774 150 YEARS OF REAL SERVICE 1924
Manufactured and Warranted BY
OLIVER AMES AND SONS
NORTH EASTON, Mass. U.S.A.
REG. U.S. PAT. OFF.
1774 150 YEARS OF REAL SERVICE 1924

AMES SHOVEL AND TOOL COMPANY

BOSTON

"Not a Kick in a Million Feet"

HONEST QUALITY CLEAR THROUGH

THE LEHON COMPANY

44th to 45th St. on Oakley Avenue

CHICAGO, ILLINOIS

"Not a Kick in a Million Feet"

Who uses "Air Lift?"

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Bisbee, Ariz.
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Hayward, Calif.
Wellington, Colo.
Daytona, Fla.
Ocilla, Ga.
Emmett, Idaho
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Kewanee, Ill.
Galva, Ill.
Melrose Park, Ill.
Park Ridge, Ill.
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River Forest, Ill.
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ADVANTAGES OF AIR LIFT PUMPING from deep wells have been related in detail in this space many times.

"Where is air lift used and by whom?" is a fair question, and one to which you should have a satisfactory answer before you buy your well pumping equipment. Here it is!

We can give you names and details of over 200 cities, towns and villages in 38 different states, where Sullivan Air Lift plants have been installed within the past ten years. Perhaps one or more of the partial list printed here is near you. If so, ask their Water Department as to results.

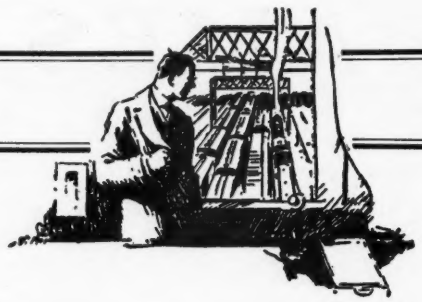
Special Railroad List on Application

Meanwhile, send for our new air lift catalog No. 1971-H

SULLIVAN MACHINERY CO.

411 Peoples Gas. Bldg., Chicago

Buyers' Guide



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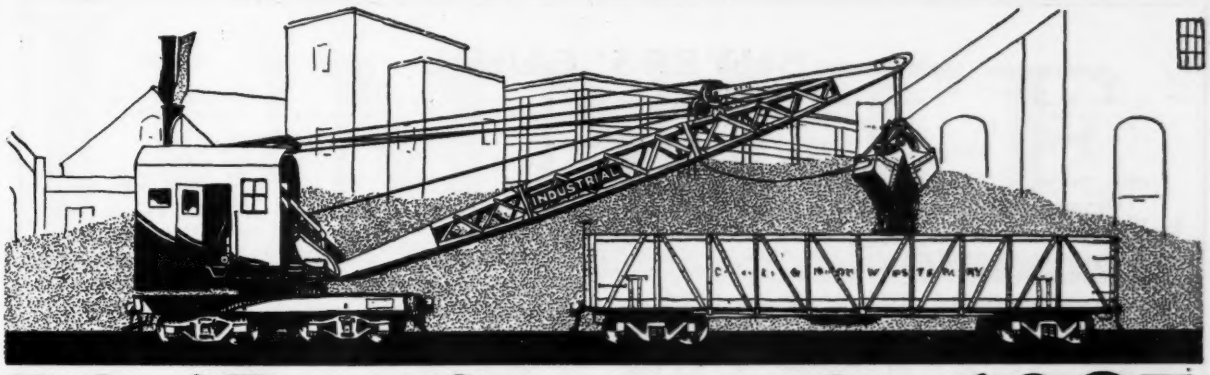

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All types of INDUSTRIAL locomotive cranes are fully described and illustrated in our Golden Anniversary catalog. A copy will be sent to you promptly upon request.

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LUMNITE CEMENT
for concrete in Cold Weather

THE rush often necessary to forestall winter can be avoided by the speed possible with Lumnite. Your big job may be shortened weeks or months by completing in a few hours those essential concrete parts for which you, heretofore, have had to wait weeks for the concrete to attain its strength.

Atlas Lumnite Cement makes twenty-eight-day concrete in twenty-four hours without the use of artificial accelerators. Lumnite Cement, because of its principal ingredient obtained from high-grade aluminum ore, Bauxite, develops at twenty-four hours greater strength than that developed by other building cements at twenty-eight days.

For work that must be done in cold weather, Lumnite has the additional advantage that it can be used in much colder weather than other cements. It is less subject to injury from frost for two reasons:

First, the rapid hydration or early hardening of Lumnite Cement brings the concrete, in a few hours, to a point in its curing beyond the danger of frost attack. Concrete made with other cements does not reach this point before two or three weeks.

Second, this rapid hardening, a chemical action, produces in Lumnite Cement concrete very considerable heat. This is an additional insurance against the attack of frost. The setting of Lumnite Cement differs from that of Portland Cement in that the setting takes place first in the interior of the mass, generating this heat, which, then, works outward to the surface.

Lumnite Cement is not "quick setting," but allows the normal time required for mixing and placing in forms. Its high early strength develops with great rapidity after the initial set has been attained. It is adapted to the various uses of concrete and is mixed and manipulated in the same manner as Portland Cement.

While Lumnite is a new product in America, cements similar to Lumnite have been used successfully in Europe for more than ten years, wherever in concrete construction there is required high early strength or resistance to the chemical action of sea water or sulphate-bearing ground water.

THE ATLAS LUMNITE CEMENT CO.

25 *Broadway,* NEW YORK CITY

Brown-Marx Bldg., Birmingham 134 S. LaSalle St., Chicago

THE ATLAS LUMNITE CEMENT COMPANY — ATLAS LUMNITE CEMENT — TRADE MARK — NEW YORK, N.Y.

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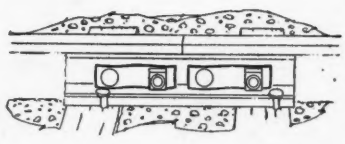
And the Burlington has been pioneering ever since. It was the first road to make a successful test of the air brake, the first to construct concrete pile bridges with slab superstructure, the first to use concrete culvert pipe, the first in many other important developments in railroad work.

It is but natural that the Burlington was the first to use Verona Rail Joint Springs. In their five years of service, the springs have saved their cost many times, through eliminating bolt tightening costs, preventing and compensating for bolt stretch, preventing battered rail ends, guarding against the pound on rail-end ties, and sparing the renewal of splice bars.

We have reports and photographs that show conclusively how well the springs have repaid their pioneering courage. The photographs could not be reproduced without retouching (which of course would destroy their authenticity) but they are available to any maintenance man who would like to see them. Shall we send them to you?



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